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ABSTRACT

Age-related changes in functional ability and work attitude affect job performance, but many variables affect the extent and timing of change for different older workers. Declines due to age occur in sensory/perceptual processes; strength, speed and accuracy of movement, and balance; and cognitive processes. Individuals can compensate for some declines, and others can be somewhat mitigated through changes in the work environment. Older workers demonstrate high levels of job satisfaction, job involvement, and internal work motivation. Alternative work arrangements and job modifications can compensate for age-related deficits. Little is known of the potential of training or retraining as a means of compensating for or overcoming the effects of age. Older worker interest in training is affected by retirement and human resource management policies. Formal training opportunities begin to decline for workers in their forties. Major knowledge gaps concern the following: (1) the impact of computers on older workers; (2) what works in older worker training situations; (3) how adult learning techniques work in a job training setting; and (4) how extensively they have been integrated into older worker training. Policy issues facing Congress include whether to increase funds for research on older worker issues, whether to consolidate federal support for older workers issues in one federal agency, and whether to develop mechanisms to encourage private sector investment in older worker research and development. (186 references) (YLB)

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TRAINING AND OLDER WORKERS: IMPLICATIONS FOR U.S. COMPETITIVENESS

Contract Report

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The assessment entitled, "Worker Training: Competing in the New International Economy," was released in September 1990.

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EXECUTIVE SUMMARY

America's workforce is aging. There is only limited knowledge of what this means for national competitiveness, for corporate and individual productivity, and for training and retraining.

Age-related changes in functional ability and work attitude affect job performance, but many variables affect the extent and timing of change for different older workers.

Sensory/perceptual processes decline with age, but individuals can compensate for some declines in vision and hearing, and others can be somewhat mitigated through changes in the work environment. Reduction in olfactory sensitivity limits the ability to detect odors that could signal hazardous conditions.

Strength, speed and accuracy of movement, and balance are the areas of motor control that decline with age and that can affect work performance. Changes in these areas may make work more difficult or they may make work performance less satisfactory. They affect workers in different types of jobs very differently.

Declines in cognitive processes also affect individuals very differently. Older workers' accuracy may balance their slower response time and performance. Declines in intelligence occur relatively late in life, and creative productivity remains stable through midlife. Memory performance and problem solving abilities among older adults can be enhanced through training and other strategies. Overall health affects cognitive abilities.

Older workers demonstrate high levels of job satisfaction, job involvement, and internal work motivation, all of which have positive effects in the workplace.

Older worker productivity can be enhanced through various proven and experimental strategies that compensate for age-related changes or accommodate the needs and desires of older workers.

Alternative work arrangements (part-time work, job-sharing, phased retirement, and post-retirement employment) encourage continued labor force participation for many older workers.

Job modifications include retraining, job transfer, job redesign, and job accommodation. Transferring to a less demanding job or restructuring job tasks around older worker limitations are relatively rare.

There is little knowledge of the potential of training or re-training as a means of compensating for or overcoming the effects of age. Although the adjustments which make training more effective for older workers are known, it is uncertain how often those adjustments are actually incorporated into skills training.

Older worker interest in training is affected by retirement policies ranging from Social Security to pension provisions, and from early retirement incentives to corporate retirement expectations. Human resource management policies that affirm a corporate commitment to older workers can increase training motivation among older workers.

Federal training programs affect only a tiny minority of older workers, primarily those at or near the poverty level. Job placement or income maintenance tend to overshadow skills training in those programs.

The private sector training investment -- for older workers or for workers in general -- is huge, but it is nearly impossible to measure it or to evaluate its impact. Lack of data on who gets trained inhibits policymaking at both the corporate and the public sector levels.

Formal training opportunities begin to decline for workers in their forties, although few companies measure whether that is an effective distribution of training resources. Less educated workers and women workers have even less access to training than their more educated and male counterparts.

A major knowledge gap concerns the impact of computers on older workers. When age-appropriate training techniques are used, older workers seem to be able to master computer use, although it may take them longer than their younger counterparts to do so. Negative attitudes about older workers and computers among managers and among older workers themselves may be limiting older worker access to computer training.

There is inadequate commitment to training older workers among policymakers, managers, and human resource decisionmakers; many older workers are reluctant to pursue training opportunities. Management training on productive utilization of older workers is a promising new development which can have long-term impacts.

Research on older worker training techniques has been limited by lack of interplay between laboratory findings and real-life training situations. Few companies understand that older workers may have different training needs, and human resource professionals do not generally acknowledge age as an issue in training design; consequently they have little incentive to learn or apply older worker training research findings.

Evaluation of training effectiveness has been minimal in both businesses and public programs. Basic skills deficits, particularly among dislocated workers and displaced homemakers, limits older worker performance in training and retraining.

Researchers and practitioners agree that training techniques such as self-paced learning and limiting stress and distractions improve older worker performance in training, but few studies document the degree of effectiveness of those techniques in laboratory or worksite settings.

Policy issues facing the Congress include whether to increase funds for research on older worker issues, whether to consolidate federal support for older worker issues in one federal agency, and whether to explore the development of mechanisms to encourage private sector investment in older worker research and development. These policy issues are particularly timely, given the amendments to the Job Training Partnership Act and the reauthorization of the Perkins Vocational Education Act that are under consideration this session, and the reauthorization of the Older Americans Act next year.

I. AGE-RELATED CHANGES THAT COULD AFFECT WORK

Job performance and functional ability are related, but their relationship is affected by a wide variety of variables. (Berkowitz, 1988) This chapter examines some of the changes in functional ability that occur with the normal aging process, and relates those changes to performance in a work setting. Changes in sensory/perceptual processes, motor control, cognitive processes, and attitudes are discussed.

One problem in interpreting laboratory findings on age-related differences in sensory, cognitive, and motor abilities is that laboratory tasks may not be representative of workplace tasks. For example, a laboratory task may not simulate the complexity or extraneous information found in a real-life setting, and may not take into account the worker's prior experience or the motivation of the worker to perform well on the job. Moreover, performance decrements may be due in part to response cautiousness or lack of familiarity with the task, as well as to physiological changes.

A difficulty in interpreting study findings on attitudes is that a high rating on one work attitude tends to contribute to high ratings on the others. Also, many of the studies are multivariate, and do not show conclusively that age (rather than tenure or job level, for example) is the causal factor.

A final caveat: Many of the medical conditions that contribute to mental decline in aging are treatable, and age-related decline is less pronounced among older people in good health (Rinn, 1988)

-- a strong argument supporting age-neutral performance assessments as a key to effective utilization of older workers.

SENSORY/PERCEPTUAL PROCESSES

Although certain age-related changes in vision and audition have been well-documented, relatively little of the research on aging and sensory or perceptual capabilities has addressed the relevance of age-related changes to real job performance in the work setting. It should be noted that the characteristics presented here do not typify any one older worker, and may not typify most individuals of a given age. Different components of sensory processes age at different rates thus affecting people at different stages of the lifespan, and there are wide individual differences with respect to any one component. However, if some reduced ability occurs at a much higher rate for those in an older age group, it is a potentially important consideration for determining the needs of the older worker.

Vision

Refractive power. From about age 30 to the midsixties, the refractive power of the eye decreases as a result of flattening of the lens, and the eye typically becomes more farsighted (hypermetropic). After the midsixties, however, the trend toward hypermetropia is reversed due to the compacting of old cells in the center of the lens, and the eye becomes more nearsighted (myopic) (Whitbourne, 1985). Compacting of old lens cells that occurs with the growth of new lens fibers in the outer portion of the lens also contributes to losses in the transparency of the lens, which is associated with declines in static visual acuity (Kline and Schieber, 1985).

Accommodation. With increasing age, there is a universal loss in accommodation, the ability of the lens to change its shape to maintain an object in sharp focus regardless of its distance from the observer. The accommodative capacity of the lens shows a gradual and nearly linear loss with age from childhood through age 65, although there is an increase in the rate of loss in the fifties (Bruckner, 1967). Focusing at short distances becomes especially difficult, and the resulting loss in near vision is called presbyopia. Corrective lenses can remedy most of these problems.

Static acuity. Static acuity refers to the ability to detect fine detail. The same peak level of static acuity observed at about age 20 is maintained through the forties, followed by a steady decline in static acuity from about age 50 (Pitts, 1982); this decline accelerates in the seventies (Anderson and Palmore, 1974). The decline in static acuity with increasing age is due to a reduction in the amount of light reaching the retina and an increase in the intraocular scatter of light, brought about by such factors as reduced transparency of the lens and reduction in the diameter of the pupil (Kline and Schieber, 1985). Age-related decrements in acuity are more pronounced under low levels of illumination. However, there is evidence that the majority of older individuals maintain good to fair corrected visual acuity through age 65 (Weymouth, 1960).

Contrast sensitivity. While acuity refers to discrimination of fine detail, the contrast sensitivity procedure measures visual sensitivity to targets that range from the finely patterned to the coarsely patterned, or that range in size from very small to very large. The test targets consist of grids of light and dark gradations; the more sensitive the eye, the less contrast is needed for detection of the grid. Relative to standard measurements of static acuity (e.g., Snellen chart measurements), the contrast sensitivity procedure is thought to better represent the individual's acuity under a variety of visual situations encountered in everyday life. This is a relatively new measure of acuity, and studies of age-related changes in contrast sensitivity have yielded somewhat inconsistent results. However, there is some consensus that aging is associated with a progressive decline in contrast sensitivity for smaller or more finely detailed targets from the twenties to the eighties (e.g., Owsley, Sekuler, and Siemsen, 1983).

Dynamic acuity. Dynamic acuity refers to the ability to resolve fine spatial detail in moving objects and is distinct from static acuity. Several studies have shown age-related declines in dynamic acuity to be more pronounced than losses in static acuity (Kline and Schieber, 1985). Dynamic acuity depends in part on the ability to perform smooth-pursuit eye movements which keep moving objects fixated on the retina. These eye movements, used to track an image across the visual field, take longer to initiate and are slower with increasing age (Sharpe and Sylvester, 1978).

Dark adaptation. Dark adaptation refers to the increase in sensitivity of the visual system in response to a decrease in illumination. Research indicates that the level of sensitivity to a dim light in the dark declines from age 20, with a more pronounced decline from the sixties on. Reduced transparency of the lens and reduced pupil size appear to contribute to age differences in the final level of dark adaptation.

Glare sensitivity. Glare results from extraneous light reducing the clarity of the retinal image, and has been classified as veiling, scotomatic, and dazzling. Age-related changes in glare sensitivity have not received wide study, particularly the scotomatic and dazzling types of glare. Veiling glare is due to the scatter of stray light across a retinal image, which reduces the contrast of the image; this type of glare might occur when room lights are turned on during a motion picture. Susceptibility to the effects of veiling glare increases with age, particularly after age 45 (Wolf, 1960). Scotomatic glare occurs when a bright light source, such as a flashbulb, overstimulates the retina. The degree of loss of visual sensitivity, and the recovery time, increase with age. Dazzling glare refers to difficulty in discriminating detail in an extremely bright visual display, but little is known about its relationship to age.

Visual field. The visual field (the extent of the area over which effective sight is maintained) shrinks progressively with age, particularly after age 55 (Wolf, 1967). Reduction in the total field size is especially pronounced after age 75.

Depth perception. Numerous visual cues can be used to localize objects in three-dimensional space. Research on age-related changes in depth perception has not been extensive, and has focused primarily on the cue of stereopsis, or disparity in the retinal images of the two eyes. There is some evidence for age differences in stereopsis, with declines observed in the forties (Bell, Wolf, and Bernholz, 1972).

Color vision. Although all age groups experience poorer discrimination of the green/blue/violet portion (short wavelengths) of the color spectrum than of the yellow/red portion (long wavelengths), this effect becomes more pronounced with increasing age, due in part to the age-related yellowing of the lens (Kline and Schieber, 1985). In addition, there is a slight decline in the number of cones (retinal receptors responsible for color vision) between 20 and 40 years and a marked decrease between 40 and 60 years (Kline and Schieber, 1985). Cone loss affects not only color vision, but also visual acuity and sensitivity to light under daylight levels of illumination.

Perceptual organization. The complex and changing pattern of light, dark, and color which reaches the light-sensitive retina must be organized by the visual system and the brain into a meaningful scene. Perceiving the meaning of a complex, changing scene may become more difficult and slower with increasing age, particularly for ambiguous, complex, or incomplete images (National Research Council, 1987; Kline and Schieber, 1985).

Visual search. When an individual must search for relevant information from a wider array of visual information, picking out the target may become more difficult with age. Extraneous stimuli seem to be more disruptive of visual search for older people. However, familiarity with the task makes it less likely that an individual will demonstrate age-related decrements when extraneous information is introduced. (National Research Council, 1987).

Implications for worker performance. The age-related changes that underlie reduced retinal illumination can be compensated for by manipulating illumination in the work environment. For example, illumination levels can be increased and contrast of visual materials heightened. However, more information is needed regarding the amount and type of illumination that will have the desired compensatory effect without creating glare (Whitbourne, 1985). Glare in the workplace can come from uncontrolled natural light and from large differences in brightness between artificial light sources (National Research Council, 1987). Presbyopia limits the range of distances at which clear vision is possible, and so tasks that require vision at different viewing distances (e.g., video display terminal, keyboard, reference documents) may need to be redesigned, or special lenses developed. Little information is available on how older people compensate for visual decline, or whether these compensatory strategies can be taught to others (Kline and Schieber, 1985). Many vision screening tasks in current use are thought to be inadequate, because they are not designed to detect visual changes of older workers, nor do they specifically address the vision skills required for a given job (National Research Council, 1987). For example, tests may not represent the levels of illumination or working distances in the workplace. Candidate skills that may be relevant to job performance include dynamic visual acuity, motion detection, visual field size, glare recovery, distance perception, and visual search.

Audition

Presbycusis refers to age-related decrements in hearing sensitivity, and may include impairments in the following abilities: sensitivity to pure tones, particularly higher tone frequencies; discrimination between different frequencies, especially for low and high frequencies; ability to localize the source of a sound, at least for lower frequency sounds; and, speech discrimination, especially under adverse listening conditions such as the presence of competing noises or messages, and the speeding up or interruption of the spoken message (Olsho, Harkins, and Lenhardt, 1985). Sensitivity to pure tones shows a progressive decline with age that is more pronounced for frequencies above 1000 Hz; loss of sensitivity is greater for men than women, particularly for frequencies between 2000 Hz and 8000 Hz (Corso, 1963; Spoor, 1967). After the middle thirties, some hearing loss is experienced by practically all individuals (Corso, 1977). Over 20% of the U.S. population between the ages of 45 and 54 is estimated to experience some hearing loss for high frequency pure tones as compared to 75% of those between 75 to 79 years (Butler and Lewis, 1977). However, the impact of declines in pure-tone sensitivity on an older person's daily function, particularly on more complex auditory functions, is poorly understood (Olsho et al., 1985). Decrements in localization and frequency discrimination have not been well established.

The perception and comprehension of speech involve specialized features, and difficulties in speech discrimination are not solely a function of reduced sensitivity to pure tones. In general, speech discrimination in quiet environments declines with age, but the loss is more pronounced under difficult listening conditions such as presentation in noise, interrupted speech, or speeded speech (Verrillo and Verrillo, 1985). There is evidence that impairments in speech comprehension under adverse conditions begin as early as the forties (Bergman, 1971). Such deficits may be related to declines in the cognitive processes which mediate speech perception, such as selective attention to one set of signals rather than others, access to the internal representation of speech signals in primary memory, access to lexical information in secondary memory, and the ability to fill in missing acoustic information on the basis of phonological, syntactic, and semantic context (Olsho et al., 1985).

Implications for worker performance. If perception of middle to high frequency signals (i.e., greater than about 2500 Hz) is critical for job performance, it has been suggested that middle aged individuals be screened for hearing loss (Hunt and Hertzog, 1981). In general, speech perception is likely to be more important in the workplace than tone detection. In the workplace speech must usually be understood under the less than ideal conditions of competing noises and messages, interruption of speech, and variations in rate. There is evidence that older individuals may wait until they are fairly certain of what was said before responding to a verbal message; this cautiousness may itself create problems in communication (Whitbourne, 1985). Conventional audiometric examinations that determine hearing loss for pure tones may not be adequate to identify losses in speech perception. Efforts should be made to relate performance on audiometric tests to the specific requirements for auditory perception in a given job (e.g., speech perception under adverse listening conditions).

The acoustic environment can be modified so as to increase communication abilities of older workers. Better face-to-face contact between speaker and listener will facilitate communication, and to this end furniture can be rearranged and obstructions removed. In addition, noise-generating equipment should be located to minimize competition with speech. Little is known about the precise room characteristics (e.g., reverberation time, width, properties that enhance binaural cues) that will facilitate speech perception for older listeners. Although hearing aids can be used to amplify speech signals, the acoustic properties of the amplified sound are less than optimal. For example, distortion can lead to misidentification of consonants, attenuation of low frequencies removes many of the affective cues critical to the intended meaning of a message (e.g., voice intonation), and amplification of ambient noise can further reduce the intelligibility of speech (Olsho et al., 1985). Measures should be devised, where possible, to counteract some of the adverse effects experienced by workers with hearing aids.

Olfaction

Research on the effects of aging on olfactory sensitivity is limited, and the exact mechanisms by which odors are detected, discriminated, and identified are not well understood. But study of the physical structures involved in olfaction indicate that age-related deterioration may begin as early as age 30 (Naessen, 1971; Smith, 1942). Studies of olfactory threshold, though flawed, tend to corroborate this early onset of decline with evidence of decreased acuity after 20 years of age (Shiokawa, 1975; Strauss, 1970; Venstrom and Amoore, 1968), and rapid losses after age 50 (Rous, 1969; Strauss, 1970). However, as with other sensory modalities, there is great variability among older adults, and decreased sensitivity does not occur uniformly across substances. Further, poor health appears to be related to lowered olfactory sensitivity (Whitbourne, 1985). Many studies which report poor performance among the elderly do not control for this factor, and the results should not be generalized to healthy older adults.

Implications for worker performance. Occupations in which a keen sense of smell is necessary for adequate performance are relatively few in number. However, poor olfactory ability may diminish one's capacity to detect and to respond appropriately to danger. Thus, safety is a primary concern despite the paucity of research. Testing should target those substances and circumstances which present hazards, particularly if contextual cues (e.g., labeling or color coding of toxic chemicals) are unlikely to present an adequate warning. Some authors (e.g., Whitbourne, 1985) also suggest the potential for negative social and work-related consequences because declining sensitivity to odors may result in a failure to maintain hygienic and cosmetic habits.

MOTOR CONTROL

In the general area of motor control, there are important age-related changes in strength, speed and accuracy of movement, and balance.

Strength and effort. Although both strength and stamina decline with age, there is a great deal of variability among people, so that a "typical" pattern of changes cannot be described. Furthermore, different findings occur depending on the particular muscle group under consideration and the type of muscular strength being measured (dynamic or isometric). The general trend is for a slight loss (about 10%-20%) as people age from the forties to sixties; thereafter the loss of strength is more pronounced (Whitbourne, 1985). Generally, the greater the mass of muscle involved, the steeper is the age-related decline in strength (Stones and Kozma, 1985). Thus, for example, the loss of strength is more pronounced in the legs than in the arms. The loss of strength is believed to be largely related to a loss of muscle mass as part of the aging process. Muscle atrophy, however, can be reduced by exercise and training.

The decline in physical performance differs considerably for "habitual" performance and "peak" performance. Tasks performed in a routine manner, such as walking, show a less dramatic decline than tasks which require short duration "explosive" output or transmission of high sustained force to the environment (e.g.

lifting, running). Stones and Kozma's (1985) extensive review suggested a 0.5% per year decrease in the level of habitual performance, but a 1.5% per year decrease in maximal performance. There are also psychophysical data which suggest that, for a given level of physical stress, there is greater perceived effort as people age; however, this has not been extensively studied or fully explained.

Motor Responses. There are age-related changes in the speed and the precision of movements. While there are a variety of contributing causes, the slowing of motor movements is probably most attributable to central (cognitive) processing, more so than peripheral factors. Therefore this general slowing with age is discussed further under the "Cognitive" section.

There is an age-related slowing of both reaction time to initiate a response, and the time then taken to execute that action. Welford's (1977) summary suggests a roughly similar slowing of both maximum speed and comfortable speed. The slowing of motor response time for older adults, relative to younger people, depends to a considerable degree on the nature of the task. Older people's reaction times suffer disproportionately when: the response is complex; responses must be selected from a variety of alternatives; the response involves movements of large extent; the response cannot be planned; there is not a straight-forward relationship between signal and response. When a task is externally paced, rather than self-paced, older adults' performance suffers disproportionately as the pace becomes more rapid.

In continuous or serial tasks, such as handwriting or sorting, the complexity of the task is a primary determinant of the degree of slowing related to age. For example, there is relatively little change with age for a simple tapping task, but pronounced slowing in writing speed or tracing figures. Since older adults tend to be about as fast as younger people in executing movements in such tasks, but spend more stationary time, this finding has been attributed to differences in the concern over accuracy, rather than speed. There have been a number of studies which indicate that older adults tend to place more emphasis on maintaining accuracy, at the cost of speed.

The motor responses of older adults can differ from younger people in terms of response kinematics (movement patterns, which include an acceleration phase, a steady speed phase, and a deceleration phase) and response kinetics (response characteristics such as control of force) (Stelmach and Goggin, 1989). Older adults show less precision in the ballistics of movement, although this is less studied than motor response speed. Studies have shown older subjects to be more variable in terms of force applied (kinetics), "on-line" corrections of movements (kinematics), and velocity adjustments (kinematics). When motor tasks are decomposed into separate components of an acceleration phase, a steady phase, and a deceleration phase for purposes of studying response kinematics, various differences may be seen, such as the older subjects accelerating less rapidly. Unfortunately, the limited research in the area of how movements are made limits current ability to describe age-related changes or identify how these factors change with age or physical status.

The physical execution of motor responses can also be affected by age-related changes in kinesthesis and in joint mobility. Kinesthesis refers to the ability to sense the position of one's body and limbs. Although there is very wide variability among older people, and little formal study, it appears that there are at least significant deficits for the elderly in sensing the position of the lower limbs (Kenshalo, 1977). Joint mobility is reduced through normal aging processes as well as common pathologies such as arthritis. Age-related losses in joint mobility have been documented for "virtually every structural component of the joints," including the resiliency of connective tendons and ligaments, deterioration of arterial cartilage, scarring and calcification of the joint capsule, and loss of viscosity of the synovial fluid within the joint capsule (Whitbourne, 1985).

Balance. With advancing age, the elderly are increasingly susceptible to falls; in fact, falls are the leading cause of death in the home for older populations, and about 40% of those over age 80 will experience a significant fall in a given year (e.g. Overstall, 1985). The greater likelihood of a fall can be attributed to typical changes in the vestibular system as well as a variety of other pathological conditions and risk factors. With aging, the vestibular system loses receptor cells ("hair cells"), resulting in disturbed equilibrium (presbystasis), in a manner parallel to the loss of auditory receptors in presbycusis (Whitbourne, 1985). Vestibular hair cell loss is apparent after age 70, and for some people begins in the fifties (Ochs, Newberry, Lenhardt, and Harkins, 1985). Dizziness and vertigo become relatively common, and the ability to make accurate positional judgments to maintain balance is lessened. Risk of falls among the aging is also associated with such factors as postural hypotension, lower extremity disabilities, muscular weakness, foot disorders, cognitive deficiencies, increased postural sway, use of sedatives or alcohol, visual disorders, and other concerns (e.g. Tinetti, Speechley, and Ginter, 1988)

Implications for worker performance. Changes in motor response have implications for the workplace. However, speed of performance in actual industrial settings often does appear to show a decline, but generally not to the extent found in laboratory studies (Welford, 1977). This may reflect the effects of experience or compensatory behaviors, but also probably reflects a self-selection bias, since those older workers suffering the greatest problems will tend to leave the job. Tasks that provide time pressure or external pacing will be more difficult. Older workers, particularly if suffering various limitations in joint flexibility, are also more likely to face difficulties in jobs requiring finely tuned motor skills, frequent hand/arm movements, standing, climbing, or repeated rising from seats.

Since pronounced effects of balance deficits are not commonly seen until beyond age 65, the workplace implications are probably limited to those jobs requiring balance, working at heights, use of ladders, etc. Vertigo can also be brought on by turning, rotating, or extending the neck (e.g. Overstall, 1985). For those of more advanced age, balance or gait problems, as well as previous falls, are believed to promote a general attitude of caution, vulnerability, and reduced confidence.

COGNITIVE PROCESSES

Speed of Behavior

The slowing of behavior with increasing age is a pervasive finding that applies to simple reaction time tasks, in which a simple motor movement must be made in response to a clearly detectable signal, and to tasks requiring more complex evaluation of stimulus information. Age-related differences generally become more pronounced as task complexity increases. There is considerable controversy over the issue of whether age-related declines in sensory/perceptual and cognitive functions result in slower performance on tasks or, conversely, whether a general slowing down of central nervous system (CNS) function leads to sensory and cognitive deficits. If mental slowing with increased age is a single process that affects all information-processing activities under control of the CNS, then it would be reasonable to develop a general index of cognitive speed (e.g., performance on a choice reaction time task) that could be used as part of a screening procedure for performance decrements (Hunt and Hertzog, 1981). Alternatively, different performance tasks may be subject to qualitatively different types of cognitive slowing with increasing age.

There is consensus that peripheral mechanisms, such as sensory and motor functions, play a minor role in accounting for age differences in speed (Belsky, 1984; Botwinick, 1984; Salthouse, 1985). Two components of reaction time can be distinguished experimentally: initiation time, or the time from signal onset to the beginning of a physical response (e.g., when the forearm muscle of the responding arm is activated), and movement time, or the time it takes to act. There is evidence that slowing is due to the central processes involved in initiation time rather than to the motor functions involved in movement time (Botwinick and Thompson, 1966; Hunt and Hertzog, 1981). These central processes might include the recognition of input, the selection of an action, and the programming of the action to be carried out; thus, the slowing of behavior with age may be attributable to loss in information-processing speed. The role of other central processes, including speed of neural events, electrocortical activity, cognitive strategies, availability of mental operations, and the capacity of working memory has been investigated, with as yet inconclusive results (Salthouse, 1985).

Simple reaction time in a task that requires minimal evaluation of a stimulus has been estimated to increase by 50% from the twenties to the fifties; response slowing begins by age 30 and continues steadily throughout adult life (Hunt and Hertzog, 1981). Age-related declines in simple reaction time are more pronounced when the stimulus event is unexpected; but there is evidence that older people can improve reaction time performance with practice (Botwinick, 1984). Similarly, on tasks requiring more complex cognitive processing such as learning and memory, there appears to be a continuous slowing of mental activity with age, although mental slowing may only become noticeable on an individual basis in late middle age (Hunt and Hertzog, 1981). Research on the speed of cognitive processes has focused on component stages of information processing, such as memory search rate. Data indicate that as age increases, there is slower access to information in primary memory, and even more marked increases in retrieval time from secondary memory (see section on Learning/Memory). As the number of items to be searched in primary memory increases, differences in search rates between older and younger subjects become larger (Anders, Fozard, and Lillyquist, 1972); however, there is some indication that age-related differences in memory search rates may be eliminated with practice (Salthouse, 1985). Performance on mental tasks requiring spatial orientation functions (e.g., mental rotation tasks) slows after age 65, and becomes even slower as the task becomes more difficult (Botwinick, 1984).

Although older people are slower than younger people on many functions, age, taken by itself, is a poor predictor of an individual's performance speed (Botwinick, 1984). Individual differences in response speed are greater among older people than among younger people. Moreover, some of the slowing in later life appears to be due to greater emphasis on accuracy rather than speed; however, the greater valuation of accuracy among older individuals probably cannot explain all of the age-related differences in performance speed (Salthouse, 1985). Other factors that must be considered in accounting for slowing of behavior include cardiovascular function and level of physical exercise. For example, there is evidence that older adults who lead sedentary lives have slower reaction times than age-matched adults who exercise regularly (Botwinick and Thompson, 1968).

Implications for worker performance. Although the job performance of older workers may be slower than that of younger workers, it is likely to be more accurate. Task demands must be considered in evaluating the impact of cognitive slowing on job performance. On tasks that require rapid responding or monitoring of several information sources at once (so that each source must be processed quickly), older workers are likely to be less efficient on average than younger workers. However, if rapid responding is not critical to job performance, age is a less useful predictor of performance (Hunt and Hertzog, 1981). Older workers do better in jobs requiring rapid performance than would be expected on the basis of laboratory results, and so the role of extensive task experience must be taken into account (Belsky, 1984). Although laboratory studies have shown that age differences in overall speed remain under conditions of moderate practice (e.g., 50 hours of practice), this level of practice is trivial in comparison with that found under real-life job conditions. On a population basis, the effects of cognitive slowing begin to appear in the forties, but insufficient attention has been paid to the mitigating effects of prior knowledge and experience.

General Intelligence

The Wechsler Adult Intelligence Scale (WAIS) is most frequently used to measure intelligence in adults. This test consists of verbal scales, which measure an individual's stored knowledge, and performance (nonverbal) scales, which measure the ability to devise a novel solution by manipulating unfamiliar material (e.g., spatial visualization or inductive reasoning problems), and often involves speeded response. In general, verbal scores show little decline until the seventies and older, and may actually increase through midlife; on the other hand, performance scores begin to decline at an earlier age than verbal scores (Belsky, 1984). From the seventies, performance on both verbal and performance scales appears to decline. It should be noted that there are large individual differences in intelligence test performance among adults over the working years (Hunt and Hertzog, 1981). Longitudinal studies, which follow the same group of individuals over an extended period of time, indicate that nonverbal measures of intelligence do not decline until the fifties, sixties, or later, and such declines are not characteristic of all individuals (Hunt and Hertzog, 1981).

It has been suggested that the two classes of abilities tapped by performance and verbal scales reflect qualitatively different intellectual abilities, referred to as fluid and crystallized intelligence. Verbal scales provide an index of crystallized intelligence, defined as the ability to apply prior learning and well-practiced problem solving methods to a current problem. Performance scales are thought to tap fluid intelligence, which involves the ability to apply a new problem solving technique to generate a creative solution to a problem. Performance of routine tasks requiring mathematical calculations would tap crystallized intelligence; more complex mathematical tasks requiring creative problem-solving methods would rely more on fluid intelligence. However, declines in fluid intelligence should not be taken to mean that a person's creative potential declines after adulthood. Other factors specific to the individual and to task requirements in a given field will influence the pattern of an individual's creative output through the working years. Some studies suggest that creative productivity, even in scientific disciplines and mathematics, remains stable or declines only slightly through midlife (Belsky, 1984).

It is possible that some of the mental decline observed in the elderly (particularly those over 65 or 70) may be due to a variety of mental conditions, some of which are treatable, rather than to the specific impacts of aging. Factors that reduce mental performance -- such as reduction in cerebral blood flow, cardiovascular disease, high blood pressure, high cholesterol levels, diabetes, sleep problems, and alcohol abuse -- are statistically more common among the elderly; yet it is possible that the very healthy elderly who are not subject to those conditions may not evidence significant declines in mental ability (Rinn, 1988). Improvements in geriatric health care may result in reductions in what are now viewed as age-related declines in mental ability.

Implications for worker performance. The validity of using IQ tests to study age-related changes in intelligence is questionable since today's elderly tend to have fewer years of formal education than younger groups, and so are less familiar with the school-related items on IQ tests, and have less practice taking tests. IQ tests measure abilities important for good school performance, yet these abilities may have little relevance for the types of cognitive skills required in different job settings, in middle and later life. Moreover, for some of the standard tests of primary mental abilities, performance is contingent on how quickly a person can solve the problems, and so some of the declines found in reasoning and spatial visualization from age 50 on may be due in part to the general slowing of cognitive processes (Hunt and Hertzog, 1981).

Learning/Memory

Research on age-related changes in memory is organized around the functioning of three proposed memory stages or stores through which information flows: a modality-specific sensory store (e.g., iconic memory), a short-term primary memory, and a long-term secondary memory. In general, there are minimal age differences in iconic memory and primary memory, whereas age-related declines have been observed in the acquisition and retrieval of new information from secondary memory.

Most studies of sensory store have focused on iconic memory, in which new visual information is initially represented. Data show that the time required to identify briefly presented visual stimuli either does not change, or changes by a negligible amount with age (Walsh, Till, and Williams, 1978). Primary memory is a temporary, limited capacity store in which information is maintained in awareness and actively processed (e.g., rehearsed). If information is stored it enters secondary memory, defined as a permanent store with unlimited capacity. The capacity of primary memory declines only slightly over the adult years (Botwinick and Storandt, 1974), and the speed of retrieving items from primary memory may be slightly slower for older subjects (Waugh, Thomas, and Fozard, 1978).

There are age-related declines in both acquisition and retrieval of information in secondary memory, although these age differences can be minimized under the following conditions: when older persons are instructed in organizational strategies for learning information (e.g., relating items to be learned to each other and to previously stored information) (Thomas and Ruben, 1973); when the learning task is self-paced rather than experimenter-paced (Canestrari, 1963); when the material to be learned is familiar and/or meaningful (e.g., discourse rather than lists of word pairs); and, when sufficient practice is given (Treat, Poon, and Fozard, 1981). The data suggest that older individuals tend to employ inefficient strategies for learning information, and benefit more from instruction in organizational strategies and from self-pacing than younger individuals (Poon, 1985). Under some conditions, older persons have shown equivalent or superior recall of meaningful material when compared to younger persons (Hunt and Hertzog, 1981; Poon, 1985; Stagner, 1985). When subjects are asked to recall the gist (higher level meaning) of a prose passage or to draw implications from sentences, some studies have shown no age decrement, but verbatim memory does appear to decline with age (Labouvie-Vief, Campbell, Weaver, and Tannenhaus, 1979; Till and Walsh, 1980). Age-related decrements in prose recall tend to be small in adults with high verbal abilities (e.g., vocabulary levels). It is important to note that memory for familiar discourse materials, similar to those found in everyday activities, appears to be minimally affected by age.

Implications for worker performance. Caution should be exercised in generalizing from memory performance on word lists and prose passages in laboratory studies to the types of learning and memory required to maintain competence in the work setting. Evidence suggests that the memory performance of older workers can be enhanced through practice, self-pacing, instruction in learning strategies, and the use of compensatory strategies (e.g., external memory aids such as notes and lists). Since performance is adversely affected when there is pressure to learn and respond quickly, older workers should be given as much time to learn and remember material as possible.

Problem Solving

Problem solving involves a host of tasks such as reasoning, language comprehension, and decision-making, and is influenced by numerous cognitive variables, such as memory, attention, and information-processing. There is a general consensus that problem solving performance changes over the lifespan; interpretation of those changes varies.

Areas of reported decrement include deductive reasoning (Arenberg, 1974), with marked declines after age forty (Friend and Zubeck, 1974), and inductive reasoning spanning a broad age range (Brinley, Jovick, and McLaughlin, 1974; Arenberg, 1968); comprehension of inferences in spoken language (Cohen, 1981); and, speed of problem resolution (Hoyer, Rebok, and Sved, 1979), particularly when irrelevant information must be ignored (Rabbitt, 1965), and sometimes accuracy of problem resolution (e.g., Hoyer et al., 1979). In general, age has been related to use of less efficient strategies, commission of more errors, and less rapid responses.

Several factors moderate this negative synopsis. Among the elderly subjects, the results of those who are in institutionalized care are often combined with healthy subjects. Cross-sectional samples are typically used. Cohort differences, such as education, can thus confound the results. Sharp, Cole, and Lave (1979) found that education was more strongly correlated with performance than was age, and a cross-sectional study of teachers found no age differences in problem solving (Lachman, Lachman, and Taylor, 1981; see also Kesler, Denney, and Whitely, 1976). Similarly, resolution of specialized problems was correlated with skill level rating, but was unrelated to age (Charness, 1981a, 1981b). Training has effectively improved older subjects' performance (Denney, Jones, and Krigel, 1979; Denney and Denney, 1974); training effects occur rapidly (Sanders, Sterns, Smith, and Sanders, 1975; Sanders, Sanders, Mayes, and Sielsky, 1976), and may persist over time (e.g., Hornblum and Overton, 1976). Finally, problem solving performance is greatly influenced by one's experience with the tasks involved (Newell and Simon, 1972). Experimental tasks are artificial and unfamiliar in nature, and may provide little information about the problem solving abilities people of any age bring to jobs for which they are adequately prepared.

Implications for worker performance. The evidence presented above suggests that the abilities involved in problem solving are sensitive to the effects of aging. They also suggest, however, that aging effects are not as dire as some results imply. Training, even with the unfamiliar, and often meaningless tasks of experimental studies, can effectively improve performance. The overall slowing of response, which is a reliable finding in aging research, suggests that problem solving performance which requires rapid information-processing, particularly involving speech comprehension under adverse conditions and demand for rapid response, will deteriorate with age. This may be of less significance if one is highly experienced and continues to perform the same work. It may have greater implications for retraining situations.

ATTITUDES

Older workers' attitudes toward their jobs are made up of a number of factors. The higher the job status, the higher the job satisfaction for workers of any age. However, even among lower skilled workers a significant proportion enjoy their work. Also, blue collar retirees tend to look back on working through rose-colored glasses -- thinking more favorably of their jobs in retirement than they did while they worked. Among older people, even those who dislike their work value the job for the social relationships it offers. (Blau, 1981) These last two factors are often cited in surveys of why retirees want to return to work -- they miss what they remember as a fulfilling period in their lives, and they miss the comradeship that work provided.

Belief in the Work Ethic. In their 1983 review of the literature on psychological characteristics of older workers, Doering, Rhodes, and Schuster found that the only personal value on which there were sufficient studies to begin to draw any conclusions was the relationship of age to belief in the work ethic. Although results are mixed, there appears to be some positive correlation between age and belief in the work ethic. However, the studies note that demographic characteristics are relatively poor predictors of values. (Doering et.al., 1983)

Job Satisfaction. There is overwhelming evidence that overall job satisfaction is positively associated with age, at least through age 60. Data are insufficient to draw conclusions for workers over 60. Job satisfaction is the attitude that is most clearly associated with age. (Doering et.al., 1983)

Job Involvement. Job involvement (defined as the importance of work in a person's self-image) seems to increase with age, but it is hard to determine whether that is the result of the aging process or of the historical situation of specific age groups. To the extent that age is correlated with length of service and job level, those factors rather than age may be responsible for higher levels of job involvement.

Internal Work Motivation. Internal work motivation is consistently related to age, but other factors such as increased levels of job responsibility or increased tenure with one organization may be more important causal factors than age. (Doering et.al., 1983)

Self-confidence. The most notable negative age-related personality changes are increased depression and decreased adjustment, often related to loss of self-confidence. (Baugher, 1978)

Organizational Commitment. Some studies show that older workers tend to be more committed to the organization than do younger workers, but it is not clear whether age or tenure on the job is the causal factor.

Flexibility. Although surveys show a perceived inverse correlation between age and flexibility in the face of change, an interesting picture of the attitudes of older people seeking and able to work emerged in a Commonwealth Fund report. Many of the estimated 1.9 million older job-seekers seem willing to work in high-growth jobs such as teacher's aide, day care provider, elder care provider, or clerical worker -- positions which would likely require training. Many are willing to accept seasonal work, long commutes, or other difficult working conditions. (Harris, 1990) This indicates a positive attitude toward change and a degree of flexibility toward work that contradicts some of the more common negative stereotypes of older workers.

Implication for Worker Performance. While job satisfaction does not necessarily cause productivity, it does contribute to it in several ways. Job satisfaction reduces turnover and limits absenteeism (Mobley, Griffith, et.al., 1979; Porter and Steers, 1973; Price, 1977; Steers and Rhodes, 1978). Satisfied workers are likely to make a company known as a good place to work, which pays off in the company's ability to attract a larger pool of qualified applicants. (Quinn et.al., 1974) Job satisfaction may improve group or organizational productivity through teamwork and communication. (Doering et.al., 1983) Job involvement also reduces turnover and absenteeism, and contributes to job satisfaction; however, it does not seem to contribute to performance levels. (Rabinowitz and Hall, 1977) A worker with a high level of internal work motivation needs less close supervision and is also likely to be satisfied with the job and have better mental health. (Warr et.al., 1979) Deterioration of self-confidence can limit a worker's positive attitude toward work. (Baugher, 1978) A worker committed to the organization is likely to be absent less often, less likely to leave the company, and a better performer. (Doering et.al., 1983) A worker who is flexible in the face of change is better equipped to handle the increasingly rapid pace of change predicted for the workplace over the coming decades.

II. STRATEGIES TO DEAL WITH AGE-RELATED CHANGES

International competitiveness has focused national attention on economic productivity, one component of which is individual productivity. Enhancing older worker productivity through a better understanding of how to compensate for age-related deficits and build on age-related strengths thus serves the national interest as well as that of individual employers and employees. (Robinson, 1986)

The very real changes that occur as a part of the aging process affect older worker productivity, both on the job and in training situations. While many of these age-related changes result in reduced physiological capabilities, as shown in the previous chapter, age-related performance declines in most occupations are so gradual and slight as to suggest that the ability to produce and learn is unaffected in many healthy workers over age 65 (Baugher, 1978), perhaps because the judgment and experience of the older worker can compensate for some of the age-caused deficits.

Moreover, population health data exaggerate the prevalence of impairment in the working population, as many people remove themselves from the work force as a direct or indirect result of age-related deficits. Sometimes, the decision to leave the work force is appropriate; other times, however, older people still able to accomplish job tasks may quit or retire because their diminished capacity makes working too stressful, unrewarding, or tiring. Age-related hearing loss is a common example of this:

The hard of hearing person is often mistakenly perceived to be inattentive, slow-thinking, aloof, uncooperative, or irritable, when in reality the person has not heard a question or instruction (or heard it incorrectly or incompletely). The frustration of being treated inappropriately by one's supervisor or co-workers because of an age-related deficit or disability can result in premature departure from the work force. (Rothstein, 1988c)

A review of age-related health data leads to the conclusion that, on the average, physical, cognitive, and psychological functions decline slowly with advancing age, with only minor impact between ages 55 and 65; only at 75 does health become a dominant consideration in the work situation. (Robinson, 1986) In a survey of human resource professionals, only 30 percent ascribed senior employees' problems to physical decline, and 17 percent cited mental decline. (American Society of Personnel Administration/ Commerce Clearinghouse, 1988)

While there are data on age-related health changes, there have been few studies of how those changes relate to job performance in particular occupations; what data may exist are in confidential company records. (Robinson, 1986) Available work site research on age differences in job performance is inadequate for drawing useful generalizations. However, common sense leads to several conclusions on this topic. First, most jobs do not demand performance at maximum capacity, but jobs requiring physical strength and a rapid work pace would be most affected by advancing age. Conversely, work which depends upon experience or on building up a clientele over time puts the older worker at an advantage. To the extent that age leads to tenure and seniority, the older worker may be in less physically demanding jobs. (Robinson, 1986) Perhaps most important for this inquiry, declines in heavy manufacturing and increases in service and knowledge jobs will likely reduce the impact of age on job performance. But finally, there is as much variation in capability among workers in the same age range as between workers of different age groups, which points toward individualized solutions rather than inflexible policy decisions.

Surveys have documented a lack of awareness in the private sector of research findings on age-related changes. This information gap inhibits informed decisionmaking. Also, there is a lack of published or easily accessible data on job performance of older employees -- a problem which limited this inquiry and which is equally problematic for business innovations and for national policy development in this field.

PRACTICES THAT COMPENSATE FOR AGE-RELATED CHANGES

Policies and practices to compensate for age-related deficits are more common than are policies and practices to build upon and utilize age-related strengths, perhaps because policymakers view older workers more as a problem than as a valued resource. (American Society of Personnel Administration/Commerce Clearinghouse, 1988) Strategies to mitigate the negative impacts of aging are discussed first, followed by several proposals that build on the positive changes that come with aging.

Alternative Work Arrangements

Many older people, both in and out of the labor force, are willing and able to hold full-time jobs (Harris, 1990). On the other hand, the aging process, coupled with our culture's expectations about retirement, limits many older people's ability or desire to maintain a full-time work schedule. Attitude toward work, interest in pursuing alternative interests, chronic health problems, changing job requirements -- any one of those conditions can make alternative work arrangements an attractive and mutually beneficial practice for older workers and management. Alternative work arrangements can generally be categorized as part-time work schedules or job modifications. (Paul, 1988)

Part-time Work Schedules

Part-time work can meet business needs for peak-time coverage, and for workforce flexibility. The disadvantage of part-time work to the worker is the potential for abuse: Businesses may use part-time work as a way to avoid offering benefits; unions have fought part-time work for fear that it may become forced on workers who prefer full-time schedules, through work sharing or other practices; training and advancement opportunities for part-timers are often severely limited. Nonetheless, part-time work is an attractive option for older people: Three out of four adults would prefer to work part-time instead of retiring completely. (AARP, 1986a) The most common part-time work schedules for older workers are job-sharing, phased retirement, and, increasingly, reemployment of retirees on a part-time or irregular basis.

Job-sharing involves two part-time workers sharing a single full-time position. (Rarely do more than two people share a position; one example is at The Travelers Companies, where 16 retirees share four positions staffing the consumer hot-line.) Job-sharing not only accommodates older workers who want or need a reduced work schedule, but also may be structured to enable an older job-sharer to train a younger partner or, perhaps, an eventual successor. Thus job-sharing may offer management a way to retain a valued senior employee while facilitating the transfer of that employee's knowledge to a younger employee who presumedly will remain longer with the company.

Phased retirement permits workers nearing retirement to gradually reduce their work week from full- to half-time prior to retiring completely. It allows the participant time to begin pursuing new interests, which may in turn help maintain a positive attitude toward work. It also allows management to begin planning for the retiring worker's replacement. Extended vacations, sabbaticals, and social service leaves for pre-retirees are variations on the phased retirement concept. "Try-out retirement" is an option at Polaroid, where workers can reduce or even terminate their work schedules with the option to return to full-time responsibilities if they change their minds.

Post-retirement employment comes in a variety of forms. Depending upon pension provisions, retirees can return to their previous employer as part-time workers, as contract workers, through an outside temporary agency, or as part of a job bank or internal temporary work pool. Each of these arrangements lets the older worker mix retirement and work; the more flexible arrangements allow time for extended vacations, medical treatment, or elder care responsibilities. (Axel, 1989)

Job Modifications

Job retraining, job transfer, job redesign, and job accommodation are the main types of job modification. Retraining is discussed in the final three chapters of this report, and the other types of job modifications are covered below. For any job modification to be effective, ongoing employee assessment is a critical element in determining what modifications are needed, and when. Regularly scheduled, age-neutral performance appraisals help ensure appropriate job matches, as does formal assessment of changes in employees' job-related capabilities and limitations; however, the technology of assessment lags behind the need (Robinson, 1987), particularly for older workers who may not perform well in formal testing situations. Formal testing needs to be tempered with informal measures, for those older adults with lower educational attainment, unfamiliarity with testing procedures, or test anxiety. (Fyock, in press)

Allowing an older worker to **transfer** to a less demanding job can be an effective way to reward company loyalty without compromising productivity. Stouffer Foods Corporation allows older workers to move from the fast-paced retail assembly line to the slower-moving institutional line if their work slows down or compromises safety. (U.S. Senate Special Committee on Aging, 1985) Maremount Corporation, an auto parts manufacturer, "down places" salaried employees who request less demanding work; most are over 50 (AARP, 1988).

Job redesign involves restructuring the work itself. Redesigning a job to accommodate older worker limitations such as difficulty in lifting, climbing, or prolonged standing is often informal and individualized, and can involve mechanization to reduce physical effort or changing job content through task redistribution. (Robinson, 1986) Organizing the work environment to eliminate common distractions can help older people whose ability to concentrate on more than one thing at a time has begun to diminish. (Miller, 1989)

However, both job transfer and job redesign are relatively rare. A recent survey of human resource professionals suggested that companies are not enthusiastic about these strategies. Older workers who can't keep up with new technology and procedures tend not to be transferred, nor do they have their jobs redesigned. Often, they stay in their old jobs, at their same pay, but their duties are reassigned to more capable staff members, resulting in attitude and morale problems. (American Society of Personnel Administration/Commerce Clearinghouse, 1988)

Job accommodations can be made to retain a long-term employee whose capacities are diminished after a heart attack or stroke, or for an employee who becomes disabled, or for an employee who for whatever reason loses the capability to continue performing the job as before. Job accommodations can range from the simple to the complex, from low-tech to high-tech. Some of the new computer-based advances have the capacity to keep older adults in the workplace longer, on condition that training is made available to the older workers and designed to mitigate their computer anxiety, common when new technologies are introduced.

[Ironically, while some new technologies can enable older people to work longer, others can cause older workers to lose the advantages of age and experience, increasing their fears of being replaced by automation. High tech skills may not necessarily provide career flexibility; technology may contribute to deskilling and trivializing jobs. (Moody, 1986)]

A simple example of job accommodation is found in McDonald's Corporation: Older workers with responsibility for assembling salads sit on stools rather than standing up. More complex are some of the products IBM and others have produced: special telecommunications devices that link deaf employees to hearing individuals; audio typewriters for blind workers; and architectural modification and special feature computer keyboards for mobility-impaired employees.

The Job Accommodations Network, an employer hotline which facilitates the exchange of information about the modifications companies have made in order to retain employees with various disabilities, estimates that most employee accommodations cost less than $1000. The network does not collect age data about the employees for whom accommodations information has been requested or reported; however, the likelihood of disabilities or decrements occurring increases with age, which makes it probable that a good many of the accommodations employers have made have enabled older workers to stay on the job.

Not only are accommodations possible and financially feasible; they may become mandatory should the Americans with Disabilities Act becomes law. The employment section of that bill covers any private company with 15 or more employees, and requires "reasonable accommodation" to employees unless it causes the business "undue hardship." The Americans with Disabilities Act as proposed appears to offer legal remedies to older workers affected by age-related disabilities -- a possibility that has been called the bill's "sleeping giant." (Fretz, 1990)

Skills Training to Compensate for Age-related Deficits

Companies have virtually no data on the relationship of age to employee training. Nor is there an adequate body of knowledge on effective ways to use training to counter the negative effects of aging. As there seems to be no evidence that companies direct much attention to this issue, it is unlikely that much training of this type exists in the private sector. Even The Travelers Companies, known for rehiring their own retirees and those from other financial services companies, does not offer returning retirees any different kinds of training than that generally available. Although trainers have observed that some of the retirees fail to complete video-based self-training, for example, no special arrangements have been instituted to alter that. (Gold, 1990)

There is some evidence that older people can learn to overcome some age-related decrements through appropriate training. For example, many midlife and older hard of hearing people appear to compensate for hearing deficits by calling on their accumulated knowledge. (National Research Council, 1988) A better understanding of how age-related changes contribute to workplace difficulties should foster the development of methods for training older people to overcome and compensate for such deficits.

There are really two issues here: What kinds of training do companies offer specifically to counter the effects of aging, and what adjustments are made to normally available training programs to make them more effective with older workers? While there seems to be little evidence that companies are addressing the first issue at all, there is information on what adjustments **should** be made to make training more effective with older workers; however, the extent to which companies are aware of these recommendations or utilize them is unknown.

Counseling Older Workers for Continued Employment

Human resource professionals acknowledge that older people's job training opportunities suffer from inadequate access to appropriate employment and life counseling. (American Society for Personnel Administration/Commerce Clearinghouse, 1988) Ironically, although programs for retraining dislocated workers generally have a strong counseling component, employed older workers facing changes in their current jobs that require training or retraining seldom have the same opportunity.

Plans to retrain middle-aged or older workers often fail to offer counseling on the serious problem of social expectations about what is appropriate in later life. Integrating life planning over the entire life course -- rather than locking people into a "linear life plan" sequencing education, work, and leisure in that order -- could create workers who are not only well prepared, but who are highly motivated to participate in training and retraining. (Moody, 1986) There is growing acceptance in the popular press and among educational theorists about the upsurge in cyclic life plans which allow more flexibility in the order and timing of education, work, and leisure (Dychtwald and Flower, 1989); yet, financial constraints limit the number of workers who can take advantage of the theory. Older workers in particular feel pressed financially when faced with the possibility of taking time out of their diminishing remaining work years for education or leisure prior to reentering the paid work force.

Training for Managers and Co-workers

Management training to address age issues in the workplace is a relatively new and uncommon phenomenon. Training managers to avoid potentially costly age discrimination lawsuits is a growth industry, responding to the fact that age discrimination is the fastest-growing type of complaint being filed with the Equal Employment Opportunity Commission. (Rothstein, 1988b) More positive training, emphasizing ways to retain older workers and keep them productive and fulfilled, is less common.

While there are many management training courses oriented toward compliance with the Age Discrimination in Employment Act, "Age Issues in Management" is the only one that focuses on older workers as a potentially valuable resource. Developed by Helen Dennis at the Andrus Gerontology Center and tested nationally in over 100 organizations, it emphasizes the benefits of effective utilization of older workers rather than the dangers of discriminatory behavior. "Age Issues in Management" is based on three assumptions: Older workers must be judged as individuals; they should be offered training and development opportunities based on an unbiased assessment of their potential; and the productive and effective use of older workers will help employers meet their own organizational objectives.

An evaluation of the long-term impact of "Age Issues in Management" showed that, three months afterward, the training continued to have a positive effect on managers' workplace relationships, their feelings about their own aging, their commitment to involving older persons in their human resource planning, and their decisions on performance reviews, retraining, and retention of older workers. (Dennis, 1988) The Dennis course was developed and disseminated with support from the federal government and corporate foundations; it is now available through the Conference Board, a business information service -- which may indicate a growing awareness in the business sector of the value of this type of training.

One example of a promising training approach yet to be tried in an employment setting is **Eliminating the Sound Barrier**, a program developed by the Regional Council on Aging (RCOA) in Rochester, New York. It has been used effectively in nursing home settings, in which both hard-of-hearing older people and professionals who work with them learn new communication techniques. RCOA has proposed to refine this proven training approach for workplace utilization, to alter those psychological and cognitive aspects that can reduce both the productivity of hearing-impaired older workers and their desire to remain in the work force. To date, however, neither a corporate "test site" nor funding to adapt the program for work settings have been forthcoming, despite the fact that hearing loss among older people accounts for the largest number of all sensory loss disorders. (McDonald, 1988) There is clearly a need for such a program in industry. There is also a need to identify any existing programs aimed at reducing the negative impact of other age-related changes, and to make them available in the work place.

Given the difficulty of calculating the productivity losses due to age-related deficits, it may be that individual businesses will not get involved in such efforts until and unless the federal government takes the leap of faith and funds demonstration research projects on that issue.

Reducing the Impact of Aging on Health

There are steps companies can take that are not related directly to older worker performance in work or training which can prevent or minimize age-related declines in health and functioning, and even help older workers become healthier. (Robinson, 1986) Hazards in the work environment (e.g., toxic substances, sedentary work patterns, noise, stressful work conditions, other unsafe conditions) may affect older workers disproportionately, both because effects of hazards such as carcinogens are cumulative over one's career span and because older workers are particularly vulnerable to hazards such as stress. Of course, reducing worksite hazards helps all workers.

Company-based health promotion programs can range from exercise programs to help in quitting smoking, and from stress management to hypertension screening. They have the potential to improve the health status and overall job performance of middle-aged and older workers.

How Retirement Policies Affect Job Performance and Training

Imminent retirement, or the perception thereof, affects companies' willingness to alter work and training situations to accommodate older workers. Most job accommodations cost money, as does training; the employer needs to be assured that the recipient of those services will be around long enough to assure payback on the investment. Workers facing retirement in the near future are unlikely to seek training. Likewise, a manager's expectation that a worker is nearing retirement limits the extent to which he or she is likely to be given important assignments, even when those assignments might be best undertaken by someone with an older worker's judgment and years of experience.

Thus, the stronger are an individual's incentives to retire, the less likely is that person's employer to implement special work or training arrangements for that person.

Public Policies

Public policy development in support of continued training and employment opportunities for older workers in the United States has lagged behind public awareness of the aging of the labor force. However, improvements in retirement income packages, rather than public policy on age discrimination or access to training, have been the major factor affecting the retirement decision (Burkhauser and Quinn, 1989) These increases in public and private retirement income sources, which have enabled more workers to retire earlier, have also reduced pressures on the government to develop programs and policies to expand older worker training and employment opportunities. (Rix, 1988)

Some of the federal policies affecting older worker employment are summarized below.

Social Security. The Social Security system affects continued employment in several ways. First, the earnings test limits the amount of income recipients under 70 may earn without jeopardizing their benefit amount. While that limit will be relaxed somewhat beginning this year, it remains as a disincentive to working. Moreover, the earnings test is poorly understood by the general population; one result is that people over 70 are often unaware that their benefit levels are not affected by earned income. Also, the 1986 Tax Reform Act altered the tax-exempt status of Social Security income, causing earned income to have a detrimental effect on Social Security benefits for workers who have significant unearned income.

On the other hand, the 1983 Social Security amendments included several incentives for continued work. The gradual rise in the age eligibility for full benefits from 65 to 67, which will begin in the year 2000, should encourage longer labor force participation by baby boomers. (There is a negative implication of this change: workers won't qualify for Medicare until age 67, and the extra two years will mean that many people -- especially minorities who have shorter life spans -- will not live long enough to draw benefits.) The 1983 amendments also increased the delayed retirement credit (the amount by which workers can increase their benefits for years worked beyond age 65) from three percent a year currently to eight percent for workers reaching 65 in the year 2008; that should also serve to keep baby boomers working longer. (Axel, 1989)

Pension policy. The Congress recently began requiring employers to recognize earnings after age 65 for pension contribution and benefit purposes, removing a disincentive toward continued work past that age. However, the Employee Retirement Income Security Act mandates that pension plans have to cover any employee who works at least 1000 hours a year; a result is that many company pension plans limit retirees' part-time work for their former employer to 999 hours a year or less. Thus, while pension provisions in these companies discourage continued full-time work in the retiree's most recent job, they may be neutral toward continuing on a part-time basis, with a different employer, or in a different industry.

Mandatory retirement. Amendments to the Age Discrimination in Employment Act first moved mandatory retirement age from 65 to 70, and in 1988 the practice was outlawed altogether for the majority of positions. However, the Equal Employment Opportunity Commission's skeletal budget has not permitted vigorous enforcement against continuation of mandatory retirement practices, and there is ample evidence that companies continue to force out executives and workers based on arbitrary age limits. (Morse, 1990)

Training. Specific federal commitment to training older workers involves only two programs -- the Job Training Partnership Act (JTPA) and the Senior Community Service Employment Program (also known as the Title V program, of the Older Americans Act). Both are essentially limited to assisting low-income individuals aged 55 and older, and neither has resources to meet the needs of even a fraction of that population.

JTPA's targeted older worker services have emphasized job search assistance over skills enhancement (Rothstein, 1989), and JTPA's one non-means-tested program, designed to serve dislocated workers regardless of income, has disproportionately underserved older victims of economic dislocation (U.S. General Accounting Office, 1987). Moreover, the Congress is considering amendments which would further limit the extent to which local JTPA programs would be required to serve workers 55 and above.

The Title V program places low-income seniors in part-time jobs with community service agencies, for which they are generally paid the minimum wage. Although some training occurs, most Title V programs emphasize income maintenance as their primary goal. (Sandell, 1985)

Displaced homemaker programs, which may receive federal funding through the vocational education or job training systems, are not specifically geared to older women, but since one-fourth of the nation's 12 million displaced homemakers are between 45 and 64, and more than half are older than that, many of the women in the programs are in fact older women. The Women's Bureau of the Department of Labor has funded the Displaced Homemakers Network to develop and test ways to provide more responsive training and assistance to these older women. (Quinlan, unpublished)

Adult basic education's $300 million in federal and state funds could supplement skills training for those older workers in need of basic skills remediation, but relatively few of the approximately 3.1 million people who participate in adult basic education classes annually are 55 or older, and few of those are taking courses for the purpose of enhancing their employability. (Seibles, undated)

Human Resource Management Policies

One impact of aging, not inevitable physiologically but common given linear life patterns, is that older workers may doubt their ability to succeed in a classroom training setting because they have been away from traditional schooling for so long. They may also fear competition with younger individuals. And, today's older workers tend to be more respectful of authority than newer labor force entrants; they may wait for a supervisor to recommend training, rather than actively seeking it themselves. (Sterns and Doverspike, 1989)

Human resource management policies that would counter these feelings of poor motivation include, for example: providing alternatives to the traditional classroom model, or preceding such training with confidence-building exercises; designing training that emphasizes group problem-solving over individual competitiveness; and specifying in managers' performance goals the training objectives for their subordinates of all ages.

Policies and practices surrounding early retirement incentives also need scrutiny. Early retirement incentive packages theoretically offer a choice, but sometimes the deal offered is so enticing that the employee feels he or she has no option but to accept. Also, the pressure from supervisors or co-workers may lend an element of force from the older worker's perspective.

PRACTICES THAT BUILD ON AGE-RELATED STRENGTHS

As demographic changes and increasing sensitivity to age discrimination result in older workers having greater workforce participation opportunities, companies can be expected to look more seriously at strategies that build on age-related strengths, if only as a bottom-line consideration. To date, though, there is little documentation of such practices; it is likely that current practices are purely based on utilization of individual older workers who are valued resources, and are not yet addressed in policy. Seniors as mentors and as technoguides are two strategies which show promise.

Seniors as Mentors

Many communities have set up mentor programs to help troubled youth, and some businesses are beginning to formalize what has been until now an unstructured mentoring role. Older people could draw upon their work experiences and life experiences to participate very productively in some of these programs.

Public/Private Ventures (P/PV), a demonstration research organization, has begun an intensive project to explore the potential for this type of relationship between elders and youth. P/PV's initial findings suggest that mentoring is not limited to people who had experienced great success in their work. In fact, the most effective elders were individuals who had not lived what would commonly be considered successful lives. They were able to turn unsatisfying or low-paying work histories into an effective basis for communication with the young people. (Freedman, 1988)

Several local mentoring projects have been initiated by the Families U.S.A. Foundation, a national foundation with an interest in productive aging. Discussions are underway in Sonoma County, California, about the potential of seniors serving as mentors to individuals with employment barriers, using the mentoring relationship to help those individuals find and succeed in jobs. The Memphis, Tennessee, community is considering a project in which seniors would draw on their lifelong experiences to serve as mentors for children from disadvantaged families.

The mentoring concept offers a way for older people to apply the wisdom and judgment gained over a lifetime in a personal context, both while they are still employed and once they have retired.

Retirees as Technoguides

A new and as yet undeveloped concept is a proposal that retirees supplement their previous career knowledge with newly acquired skills in technology assessment so as to help test, evaluate, and propose improvements in cutting-edge products, particularly as they relate to older people. These "technoguides" would acquire new and relatively untested technologies, such as home robots or hydroponics stations, and test them in exacting ways, drawing on their pre-retirement career expertise. They would then advise business and consumers on the pros and cons of the technologies thus tested. (Shostak, 1988)

To the extent that the technoguide concept has been tested, retirees have served on a volunteer basis. However, should the technoguides' evaluations prove useful to business in developing, refining, or marketing new products, the technoguide role could conceivably become that of a paid consultant to business clients, as long as care would be taken that the technoguides are able to maintain the objectivity of their evaluations.

III. OLDER WORKERS' ACCESS TO TRAINING

Training and retraining are the critical issues in determining the competitiveness of the American work force. If older workers are to participate fully in a productive economy, they must have access to appropriate learning opportunities. This chapter examines the extent to which older workers participate in training, some of the factors that limit their participation, new training opportunities, and knowledge gaps that inhibit effective policy development in support of older worker training.

Training Expenditures and Opportunities

Despite the many billions of dollars companies spend on training and retraining their employees, it is extremely difficult to quantify the amounts of money spent or the amounts of in-house or purchased training that result. Reporting on its 1989 survey of employer-sponsored training, *Training* magazine estimated that companies with more than 100 employees budgeted $44.4 billion for direct training expenses in 1989 -- a 12 percent increase over 1988's figure. The American Society for Training and Development's estimate for expenditures on formal training is lower -- around $30 billion -- with the caveat that employers supplement that expenditure with anywhere from $90 billion to $180 billion for informal on-the-job training. (Carnevale, 1989) Other experts, however, view existing estimates of the volume and dollar value of job training as highly suspect. (Eurich, 1985; Mangum, 1989; Vaughan, 1989)

Estimating the share of the private sector training dollar that goes to older workers is even more challenging than estimating the size of the private sector's overall job training expenditures. Reliable data -- or even experts willing to speculate -- on the amount or percentage of training and retraining funds spent on older workers are nearly impossible to find. (Sheppard and Rix, 1989) For example, researchers at Training magazine said that none of the magazine's more than 2,000 survey questions dealt with the age of trainees or with any age-related issues. Nor was age an issue in a recent report for the Joint Economic Committee on the availability of, and gaps in, workforce statistics; but that report mentioned workforce training only in passing, noting that reliable data on job competency or the training provided at work are scarce. (Levitan, 1989) A survey of human resource professionals on employee retraining programs included a section on the kinds of employees who undergo training, but the breakdowns were by job category and status in the organization -- not by age, or even tenure in the job. (Blocklyn, 1988)

There is evidence that the proportion of employer-provided training declines by age within the older worker population; workers in their forties receive more training than those who are older. (Meier, 1988) And, in contrast to younger workers, relatively few older workers obtain formal training; in 1987, for example, workers between 45 and 54 comprised only 15 percent of employees trained, and those over 55 accounted for only eight percent; in contrast, workers between 25 and 44 made up 68 percent of the employees trained that year; (Carnevale, 1989); comparable figures on the age breakdown for on-the-job training are not available. It should be noted that the above figures do not address hours of training, type of training, multiple training experiences in a single year, or even whether the company or the individual paid for the training. Also, some of the age discrepancies relate to the more intense training needs of entry-level workers, most of whom are young; increasingly, corporations are paying for basic skills remediation for these young labor force entrants in addition to the usual job training.

Age as a Factor in Access to Training

Experts agree that employers invest less in older workers because they expect to recapture less of their investment during the older employee's shorter remaining work life. (Tan, 1989; Vaughan and Berryman, 1989) Yet companies generally know little about the actual costs and benefits of special training for older workers; only 11 percent of organizations in one survey reported that they analyze the costs and benefits of training employees over 50. (Rosen and Jerdee, 1989)

Several factors may help explain the lack of data on the impact of training on older workers. First, the fact that those private companies which evaluate their training programs tend not to collect age data on trainees contributes to the data gap. Second, little useful information has been compiled from the experience with publicly funded training; the most recent evaluation concerned with service to older workers through the Job Training Partnership Act looked only at spending levels and numbers of trainees rather than type or impact of training. (U.S. General

Accounting Office, 1990) Nor does the nonprofit sector have data that offer much insight into computer training for older workers. (Alegria and Lordeman, 1988) Third, federal budget constraints limiting research in general, in tandem with the federal Administration on Aging's move away from employment as a focal point of its research agenda, resulted in sharp cuts in the grant support for such work. One unfortunate casualty of federal spending decisions was that the National Council on the Aging's excellent journal, Aging and Work (formerly Industrial Gerontology), in which studies of this type had been reported, lost its federal funding in 1984, and nothing comparable has arisen to fill that void.

Age is not necessarily a totally reliable predictor of access to training, depending upon other employee characteristics and economic circumstances. In their often-cited report, **Private Sector Training: Who Gets It and What Are Its Effects,** Lillard and Tan conclude that, after the first five years in the labor market, the likelihood of training rises with time on the job for individuals who develop an enduring job attachment, while it falls for those who switch jobs frequently. In particular, "the inability to develop enduring job attachment increasingly reduces the likelihood of getting training, especially for older workers." However, they found that mature men (ages 45-59) had greater likelihood of being trained during periods of high national unemployment, perhaps because employers are more likely to retrain older workers when the opportunity cost of their time is low. (Lillard and Tan, 1986) If the converse is true, as various experts have suggested, managers of valued older workers are reluctant to free them up for training during a boom economy because of the relatively high cost of their time when there is more "productive" work they could be doing (e.g., Rosow and Zager, 1980; Sterns and Doverspike, 1989).

For older women, the twin barriers of age and sex limit access to training, and affect what types of training are available (Shaw, 1988). There is evidence that the Employment Service may be less likely to provide job counseling or suggest training for women over 45 than for younger women. (Pursell and Torrence, 1980) And although training leading to a professional certificate, but not clerical training, increases the wages of women with interrupted work careers (Appelbaum, 1981), which is the case for many older women, clerical training is the most common type of training offered to older women who have the literacy skills to qualify.

The economic necessity that older workers have adequate training opportunities is underscored by the fact that earnings and productivity changes over the life cycle are directly related to investments in further training. It appears that physiological aging, changing work attitudes, and age discrimination are relatively unimportant determinants of income as compared to the effects of skills accumulation and obsolescence and incentives for employers and employees to invest in training. (Andrisani and Sandell, 1985)

The Age Discrimination in Employment Act (ADEA) specifically prohibits companies from denying training to workers on the basis of age, and there have been several suits in which older workers were first denied training and later suffered adverse consequences for lack of training. When CBS switched from film canisters to video technology, for instance, they trained their newer, younger workers in the new technology; older workers sued when a subsequent reduction in force disproportionately impacted the older workers because they had not been trained.

A 1989 case involved an office machines serviceman in Kansas City, Missouri, who successfully sued his employer, Monroe Systems. The employee -- the oldest of six servicemen in the Kansas City office -- had been discharged in a reduction in force because he lacked photocopier training, although he had repeatedly requested such training, and younger servicemen received training. There have been similar cases against Westinghouse and National Cash Register, when age-based denial of training resulted in subsequent job loss. The faster technology changes and the more sophisticated the senior lobby becomes, the more likely it is that there will be more suits of this kind.

Management Attitudes about Training Older Workers

Managers make the final decisions about which workers hold which jobs, which workers participate in company-sponsored training or retraining programs, and which workers are retrained, laid off, or offered early retirement incentives. To the extent that managers' attitudes about older workers affect decisions about whom to train or place in specific positions, the older worker may be caught between the risk of obsolescence and the lack of opportunity to overcome it. When managers' attitudes toward older workers are negative, those attitudes inhibit efforts to enhance age-related strengths or compensate for age-related deficits in training and work situations.

Various studies document the existence of management and executive attitudes that limit the job options and training opportunities of older workers. (Rhine, 1984; Rosen and Jerdee, 1976; Rosen and Jerdee, 1989; Yankelovich, 1985; Yankelovich, 1989) This research suggests that age stereotypes strongly influence management decisions. While surveys show that managers generally view older workers as loyal, with good work habits (e.g., attendance, punctuality), a commitment to quality, and a strong work ethic, they rate older workers less favorably on flexibility, adaptability, and aggressiveness -- the very qualities that relate to competitiveness. (Dennis, 1989) They are seen as experiencing learning difficulties in training, and having trouble mastering new concepts, ideas, and approaches. (Rosen and Jerdee, 1989) Corporate managers surveyed in the mid-1970s did not attribute positive motives to older workers desiring retraining, and favored career development for younger workers but not for older ones. (Dennis, 1989)

Even when training is seen to be the key to productivity enhancement, there is evidence of a lack of commitment on the part of management to training older workers. AARP's 1989 survey of management attitudes, for example, showed that 55 percent of the human resource executives surveyed believe that skill training for older employees would be effective in increasing their utilization; despite that finding, only 29 percent of the companies surveyed have implemented such programs. (Companies with more than 1,000 employees have made somewhat more progress recently in instituting older worker training programs: 35 percent have done so, compared to 24 percent four years ago.) (Yankelovich, 1989)

Ironically, managers who value the work of individual older workers and assign them to high-priority projects may discourage them from participating in training opportunities, viewing them as critical to the accomplishment of short-term goals and too valuable to spare for training. Because older workers have higher pay and productivity than younger workers, lost work time is more expensive for the employer in the short run. A long-range perspective on human capital investment can counter this tendency, particularly when managers' performance is judged in part on their subordinates' participation in training. (Rosow and Zager, 1980; Sandell, 1985)

Human resource professionals' views are similar to those of management. In a recent survey, two-thirds felt that older employees' loss of motivation or complacence contributed to those employees' career problems. The fact that few companies conduct annual needs assessments to identify training needs contributes to attitudes of disillusionment on the part of older workers; they are passed over for advancement year after year, but are given no information about how to move on to the next rung of the career ladder. (American Society of Personnel Administration/Commerce Clearing House, 1988) Yet training has been shown to be an important way for older workers to achieve job satisfaction. (Sterns, 1987)

Perhaps the belief which most limits company efforts to institute affirmative training policies is the perception that older workers tend to be less flexible and more resistant to change. (Rhine, 1984; Yankelovich, 1989) Change is a constant in today's workplace; management concerns about older workers' ability to cope with change can curtail those workers' opportunities to advance, or even to continue to work. Certainly, managers are unlikely to seek out the research findings on ways to accommodate older workers if they view those workers as inherently less productive than others.

What managers need to realize is that older workers as a group don't resist change; what sometimes happens is that companies perpetuate a self-fulfilling prophecy by training and retraining their younger workers, leaving the older workers unprepared to deal with organizational changes that require new skills. When older workers do have the opportunity for retraining, their stronger attachments to the jobs, occupations, and colleagues they may be leaving behind as a result of retraining may cause them to suffer some grief in disconnecting from the past. This disengagement process is natural, and doesn't indicate resistance to change. (Miller, 1989)

A corollary to the belief that older workers resist change is the expectation that older workers will resist being trained in new skills or on new technology. Half the managers in one survey felt that older workers are less likely to avail themselves of programs to upgrade job skills, characterizing older workers as less ambitious for advancement, less aware of their need retraining, or less likely to seek training because they -- the older workers -- saw few promotional opportunities or because they saw themselves as toward the end of their careers. (Rhine, 1984) A more recent survey found 59 percent of human resource administrators experiencing resistance to training on the part of older employees. (Rosen and Jerdee, 1989)

Many of the negative stereotypes toward older workers developed during the rapid industrialization and labor-intensive employment expansion of the period between 1920 and 1940, when efforts to increase productivity focused on practices to increase the speed of work which, it was assumed, would decline with age. These views have persisted over time and have expanded to include negative expectations about skills obsolescence, reduced learning capacity, resistance to change, and slower decision-making with aging. (Morrison, 1986) As with most stereotypes, these have some basis in fact; however, as shown in the previous chapter, individual older people and adjustments in the job or training situation can compensate for many age-related changes.

These negative beliefs about aging are behind many of management's inappropriate decisions limiting older worker training and advancement opportunities. As recently as 1985, for example, employers in industrial settings were found to be reluctant to hire and train new employees over 40 or to retrain those already on the payroll -- despite evidence that those workers are healthy, dependable, and productive, with low accident rates. (Sterns, 1989)

Management training on age issues can be effective in changing managers' perspectives and decisions vis-a-vis training older workers, and in challenging concerns about the return on the investment in older worker training. Managers who participated in the "Age Issues in Management" course described earlier reported that the training made them more inclined to retrain older employees, more patient with the time it takes older workers to learn, and more cognizant that a formal training program is sometimes necessary and appropriate. (Dennis, 1989)

Older Worker Attitudes about Training

As suggested earlier, older workers who fear or resist training can limit their own opportunities as much as can management attitudes. Many older people look forward to the end of their labor force participation with anticipation. Older workers who are concerned about their ability to perform in a job or a training situation, who feel unappreciated by supervisors or co-workers, or who view retirement as a positive goal to be achieved as soon as possible are unlikely to seek training or advancement opportunities, and may leave the work force once they have the financial ability to do so.

Older people's attitudes toward work and training are affected by their attitudes toward their own capabilities, toward their value in the workforce, and toward retirement versus continued work as a personal goal or right. When older workers perceive themselves as having reduced capacity to perform in training or in a job, they may have "bought into" the widespread devaluing of older people in American society, or they may be reacting to their own declining health, or they may be responding to the physiological changes identified earlier in this chapter. Their beliefs about their value in the workforce are certainly influenced by management attitudes and feedback from co-workers, and they are also cognizant of the underlying assumptions of early retirement incentives aimed at getting older people off the payroll. Finally, retirement has come to be viewed as a right in our society. Not all work is stimulating or fulfilling, and some jobs are simply physically exhausting over time.

Despite pervasive negative stereotypes about the degree to which older workers can benefit from training, one survey of workers 40 and older found more than four out of five expressing interest in training opportunities. Nearly 40 percent wanted to update their current job skills, while 24 percent sought training to prepare for a similar or better job. Eleven percent were interested in training for a completely different job, and 10 percent wanted training unrelated to their career. Workers between 50 and 62 were most interested in training to update their current job skills, while those between 40 and 49 preferred training for a new position. Even workers over 62 expressed a high level of interest in obtaining training; 54 percent sought some type of job-related training, with most of those seeking to improve current job skills rather than to prepare for a new position. (AARP, 1986)

If indeed older workers have the approach-avoidance attitude toward training that the contradictory evidence above would indicate, it may be because they doubt their ability to succeed in a classroom training setting, having been away from traditional schooling for so long. For that reason, probably the most effective human resource policy in countering older workers' resistance to training is one that very specifically encourages continued training regardless of age. When lack of self-confidence is the main barrier to an older worker's participation in training, that worker's confidence may rise simply because the company is willing to invest money in that worker. (Miller, 1989)

Training to retain a current job is one issue; retraining older workers for new careers presents more complex challenges. The main problem with retraining for new careers is motivation; older people need firm reasons to undertake the risk inherent in career change. Experience with retraining has shown that life changes such as divorce or plant closings can provide the necessary motivation. Displaced homemaker programs are a good public sector example of the feasibility of building on the capacities of age and experience. (Moody, 1986) Older blue-collar workers change jobs primarily as a result of poor health or being laid off; (Atchley, 1986) such changes may or may not require retraining. In any case, there are few data on how common mid-life career change really is.

Organized Labor's Position on Training Older Workers

As would be expected, organized labor has a somewhat different perspective than management on training opportunities for older workers. The traditional and primary labor response to skill obsolescence and worker displacement has been to secure the worker's negotiated benefits such as severance pay or pensions; however, age-based labor responses to these situations increasingly includes issues such as retraining and job redesign. (Wineman, 1989)

Seniority rights and technology-related training agreements have protected many older workers from displacement. The International Association of Machinists, for example, adopted model contract language calling for on-the-job training at prevailing wage rates, with senior employees having first claim on training opportunities.

The United Automobile Workers (UAW) has also been notably successful in its support of experienced workers' training rights. In anticipation of a new statistical process control system, the UAW negotiated an agreement with Ford Motor Company which resulted in mathematical skills and computer skills training for experienced workers; without the training, those workers were at risk of displacement. The Ford/UAW Guaranteed Income Stream (GIS) benefit program, negotiated through collective bargaining to provide additional benefits to high-seniority workers in the event of a layoff, required that GIS recipients be available for retraining. Also, many middle-aged workers were among the former General Motors workers hired by New United Motors Manufacturing, Inc. (NUMMI), a GM-Toyota joint venture; some of them went to Japan for classroom and on-the-job training, then joined management representatives in designing training for the rest of the workers. (Meier, 1988; Wineman, 1989)

The Communication Workers of America and American Telephone and Telegraph agreed on a career-development approach to the skills retraining program negotiated in 1983, which was aimed at workers of all ages who were affected by the rapid technological changes in the communications industry. The career-development strategy was recommended to lessen older workers' feelings of task or skill dislocation. (Wineman, 1989)

In an interesting twist on the management training issue, the leadership of the International Ladies' Garment Workers' Union participated in a slightly altered version of the Dennis "Age Issues in Management" course, as a way to expand its understanding of its membership. Training and education needs of the older worker was one of the issues covered. (Wineman, 1989)

Impact of Retirement Income Expectations on Training

Finally, pension and social security policies have an impact -- although admittedly indirect -- on the extent to which older workers actively seek or take advantage of training opportunities. As work disincentives in the social security system begin to ease, older workers may see work as more attractive than complete retirement, even though pension rules may still provide strong disincentives to continue working. Those who want to work may increasingly do so by switching jobs after departing from their career jobs, so as to be eligible for pension benefits. (Burkhauser and Quinn, 1989) To the extent that such job switches require retraining, rather than simply continuation of the previous work under new circumstances, older workers can be expected to seek retraining opportunities.

It is possible that, over time, changes in pension systems may increasingly permit workers to combine partial pension benefits with part-time work on the career job. In that case, older workers will still need to keep their skills current in the career job, but will not be faced with preparation for an entirely new position.

Emerging Suppliers of Older Worker Training

Proposed amendments to the Job Training Partnership Act suggest that federal support for older worker training programs is likely to decline, or remain static at best. Corporate training departments are not currently showing a tendency to tailor training to older workers; more than half the companies in a recent survey acknowledged an insufficient organizational commitment to investment in training older workers. (American Society of Personnel Administration/Commerce Clearinghouse, 1988) Private for-profit training vendors have not expressed much interest in developing specific older worker training programs (Camery, 1990). Consequently, alternative training sources need to be examined.

Continuing education programs. One increasing source of retraining as the population ages will be colleges and universities' continuing education programs. Until recently, these institutions had not catered to the needs of part-time and older students. Factors such as lack of financial aid for part-time students, inflexibility in course scheduling, and counseling and job placement services available only during the day have limited older workers' access to these institutions. In the last two decades, universities have begun seeking older returning students, and recent legislation opened up financial aid opportunities for part-time students. (Shaw, 1988)

Still, the main problem with this form of retraining is the question of who pays -- employers, unions, or government will need to make loans or subsidies available if this option is to be effective, as full-time retraining is out of reach financially for most employees. (Kearsley, 1989) An additional problem with this option is that many older workers have been away from the classroom for so long that the prospect of returning is a frightening one; continuing education programs will need to make adjustments in both their marketing and their teaching techniques to overcome that reticence.

Vocational schools. Vocational schools have long been instrumental in training and retraining people for work, but older workers have not been a major component of their student population. Former American Vocational Association president Gene Lehrmann blames that situation partly on the federal government, claiming that federally mandated paperwork and bureaucracy have limited vocational institutions' capability to serve older people's employment needs. He predicts a growth in the role of vocational education in retraining older people for second careers in skill shortage occupations such as health care workers, travel agents, and computer operators.

Vocational schools have some experience with older workers from their involvement in dislocated worker training. For example, when Chrysler Corporation moved out of Kenosha, Wisconsin, leaving 10,000 workers unemployed, the local vocational school drew up a contract with the company, the union, and the state to provide counseling and retraining. Similar partnerships are possible specifically for training older people. (Roberts, 1990)

Apprenticeship training. Formerly limited to people under 45, apprenticeships are no longer restricted by age, and older people are beginning to take advantage of that opportunity. Also, many program sponsors are having difficulty getting applicants; like some employers, they are turning to new labor pools such as older workers. (Although apprenticeships clearly provide career training, they are considered an extension of the educational process -- a rationale used to exempt them from ADEA coverage. The Bureau of Apprenticeship Training removed the upper age limit of 45 administratively.)

Many of the older apprentices come into the program as dislocated workers. The Bureau of Apprenticeship Training works with dislocated worker centers around the country to set up new apprenticeship programs and to recruit applicants. There are no differences in the training or work processes for older apprentices. However, a new practice which helps some of the older dislocated workers is that incoming apprentices get credit for prior experience, which allows them to come in at higher levels on the apprenticeship career ladder (and at higher wages).

Of the 174,506 apprentices age 16 and over in the Bureau of Apprenticeship Training's data base in February 1990 (which includes 70 percent of apprentices nationwide), 7,477 were 45 or older, representing 4.2 percent of the total. Although that sounds like a small rate, the average age of apprentices has risen BAT's acting director, Minor Miller, estimated that from 27 to 29 just in the last two years. These older apprentices are predominantly male (92 percent) and white (81 percent).

Other opportunities. Generally, companies with a commitment to human capital investment concentrate their efforts on providing training to all their employees. As the labor shortage intensifies, more companies are likely to find it to their advantage to invest in training older employees. Further, one of the stated purposes of ADEA is "to help employers and workers find ways of meeting problems arising from the impact of age on employment"; although virtually nothing has been done toward accomplishing that purpose, ADEA clearly opens a door for federal involvement on a "carrot" rather than a "stick" basis.

Lack of Data as a Barrier to Policy Development

Important questions remain unanswered. While anecdotal information and attitudinal surveys seem to indicate that older workers in many companies and industry sectors have inadequate training opportunities, little or no conclusive data exist to confirm or deny that hypothesis. Even the Bureau of Labor Statistics has never used its labor force surveys to obtain information on workers' training experiences by age group. (Rones, 1990)

Even when companies appear to have affirmative training policies vis-a-vis older workers, specific information may not be readily available. In the 1970's, General Electric Company concluded that it would be less expensive to retrain their educated but outdated engineers in new technology than it would be to hire new employees, and has continued to follow that policy. (Sheppard and Rix, 1989) GE's electronics facility in Utica, New York, for example, has recently received favorable publicity for its long-standing programs to train its older engineers and technicians in new technology (Wall Street Journal, January 4, 1990; Sheppard and Rix, 1989); yet, when contacted for this study, managers at the Utica plant were unwilling to provide specific information on the training or those who participate in it, and expressed discomfort with the publicity the plant has received to date. (Zukowski, 1990)

Another example of GE's lack of data despite positive policies toward older worker training is found in the comments of a senior executive from the Aircraft Engine Business Group. Observing that a 1985 attitude survey of AEBG professionals showed that employees 60 and over felt the same as younger employees about their opportunity to improve their skills, he added that GE's policies "are so age-neutral that no statistics are kept on [age of candidates for training]." (National Council on the Aging and Institute of Electrical and Electronics Engineers, 1986)

Individual companies are not required to keep data on the ages of employees who receive various types of training, and few companies appear to do so. Even companies such as IBM and Aetna, which are known for their employee training and retraining programs, do not generally collect information on the age of their trainees. (Burdick, 1990; Lineburgh, 1990) In one IBM training program in which age data were analyzed, however, it was found that employees over 45 participated at lower rates than younger workers. The availability of the training was not enough; older people were uncertain that it was worthwhile or feasible to participate, and had fears about their performance in the training, about being shifted in their jobs, and about the company's general commitment to them. (Moody, 1986)

The Travelers Companies, perhaps the foremost among American corporations in encouraging continued employment for older workers both in their career jobs and after retirement, has no information on the ages of employees who seek computer training at the company's self-study centers. (Gold, 1990) Not one of the 12 corporations interviewed for a 1983 study on training and retraining for changing technology reported collecting detailed trainee age statistics; the training program administrators perceived no need to do so. (Coberly and Paul, 1983) This may be because human resource professionals believe that retraining reaches all levels, that everyone is required to attend training programs to refresh their skills, and that any worker who is interested and who has the necessary basic skills and work record is eligible. (Blocklyn, 1988)

Most companies could probably produce age data on their trainees, if only by examining personnel records or reviewing the ages of people who have participated in company-funded in-house or outside training. However, this inquiry identified none which do that as a matter of course. Furthermore, companies which may compile such data would not be inclined to make it public. First, companies are reluctant to make details about staff training available to their competitors. Second, more than one human resource development specialist interviewed for this report expressed concern that even the collection of age data on training participants could be illegal under the Age Discrimination in Employment Act (ADEA) -- a misperception, but apparently not an uncommon one. Finally, those companies with less than a sterling record regarding provision of training to older workers would be concerned about the potential of age discrimination suits under ADEA; it would be unlikely that such companies would keep potentially incriminating records which could be subpoenaed in the event of a suit.

Nor does this area of inquiry appear to be on the research agenda of national trade associations. The National Association of Manufacturers (NAM), which represents many of the companies at the center of the restructuring, retooling, and retraining activities of the past decade, has not focused on age as a factor related to its members' human resource development needs or practices. NAM is in the planning stages of a survey on training practices in member companies, but age of trainees is not a major issue to be addressed, and may not be included in the survey at all. (Lunnie, 1990)

Conclusion

While some older workers may indeed be resistant to training, fearful that learning new skills may be too much of a challenge or unwilling to admit that old skills have become rusty or outdated, corporate unwillingness to make the necessary investment in training and development of seniors is an equally great problem. (Rosen and Jerdee, 1985) Despite overwhelming acknowledgement among human resource managers that there is a need for affirmative training and development policies for older employees, top management support is less strong. (American Society of Personnel Administrators/Commerce Clearinghouse, 1988)

Nonetheless, American industry's lack of commitment to training, developing, and accommodating older workers must be seen in the context of the overriding cost-cutting trend that drives human resource management policies for the workforce as a whole. Only in the past few years has there begun a groundswell to implement -- or at least examine -- enlightened policies to attract and retain valued workers, spurred in part by the publication of **Workforce 2000** and its emphasis on the coming labor shortage and on the changes in the composition of the labor force.

As management attitudes toward the value of retaining their existing workers change, policies supportive of older workers can be expected to increase as well. Positive policies would include: actively supporting the Age Discrimination in Employment Act, rather than limiting compliance to measures that will avoid lawsuits; implementing health promotion programs and structuring jobs to reduce stress; using an objective, age-neutral performance appraisal system; offering retraining programs that incorporate what is known about older worker learning patterns; conducting management training on effective utilization of older workers; implementing alternative work schedules; and making career planning a requirement for middle-aged and older workers. (Dennis, 1988)

IV. IMPACT OF COMPUTER-BASED INNOVATIONS

Status of the Data

The rapidity of technological developments and the pervasiveness of computers and computer-assisted tools is a given in today's workplace, and will only intensify in the decades ahead. Technological change produces changed circumstances for older workers, and implies a need for ongoing retraining. (Andrisani and Sandell, 1985) Yet, there is little documentation about what happens to older workers when computers are introduced into the workplace. This is not surprising, given the data gaps identified in the previous chapter, and the fact that most studies on the impact of technology on jobs and workers have focused on quantifying the number of workers likely to be displaced by technology or the number of new jobs likely to be created, rather than how to retrain people affected by technological change. Consequently, there is not a lot known about how to best train workers of any age for specific technologies. (Kearsley, 1989)

Even a study entitled **Retraining the Older Worker for Changing Technology** prepared for the Office of Technology Assessment several years ago shed little light on special issues or practices related to retraining older workers. As the authors explained, employers and training organizations could not relate to the need to train older persons any differently than younger ones. Trainee age is rarely taken into account in designing and implementing their training and retraining programs. However, the study found no evidence to suggest that older participants suffered as a result. (Paul and Coberly, 1983)

Another OTA report did examine training for new technologies as part of a larger study on office automation; however, its very brief treatment of the older worker's stake in changing skill requirements minimized the changes that occur with aging and referred only to the role that management attitudes might play in limiting training and retraining for older workers. (U.S. Congress, Office of Technology Assessment, 1985)

The National Research Council's otherwise extensive report on technology and women's employment did not address the role of age in utilization of workplace technology. (Hartmann, Kraut, and Tilly, 1987) The only reference to age as a factor in retraining cited a 1984 Kelly Services survey of more than 500 secretaries and administrative assistants, in which younger secretaries said their knowledge of word processing is more important than such customary skills as shorthand, while their older counterparts placed more value on such traditional abilities. Younger secretaries also experienced a much higher incidence of pay raises resulting from their new word-processing skills than did their older colleagues. (However, the survey defined "younger" as "under 25", which limits its utility for the purposes of this report.)

A review of training programs designed to ease the impact of technology, arranged both through collective bargaining and through state initiatives, likewise paid little attention to age as a factor in retraining employees to use computers and computer-assisted tools. (Deutsch, 1987) However, in the case of training resulting from labor negotiations or joint labor/management cooperation in particular, the average age of participants is relatively high since seniority determines access to the training. The Ford/UAW program implemented for the 2,000 dislocated workers who were affected when Ford closed its Milpitas, California plant served workers with an average age of 42. It offered support services, counseling, basic education, skills retraining, and job search training -- services that must have worked well for the older trainees as only 18 percent of the Milpitas displaced workers remained unemployed two years after closure.

Performance of Older Workers in Computer Training

Of those age-specific studies that do look at adult performance in computer training, most relate to the older worker's ability to learn to use computers for word-processing:

- Recent research examining older women's computer trainability and attitudes toward computers, supported by the National Institute on Aging, found that women 55 to 70 years old performed as well as young (25 to 39) and middle-aged (40-54) women. Three training methods were evaluated: instructor-based, manual-based, and computer-based (on-line). Computer-based training was the least effective for all three groups, but it was especially ineffective for the older women.

The older women learned best in active, problem-solving situations, and were accepting of and willing to use computer technology once the researchers adapted the training and software to accommodate age-related learning differences. Specific adaptations included: using goal-oriented, problem-solving training rather than a step-by-step, progressive drill and practice approach; teaching computer concepts through mental models and metaphors based on familiar ideas; emphasizing the spatial aspects of text editing, such as onscreen cues of text location, and incorporating visual aids to help learners master the onscreen cues. (National Council on the Aging, March-April 1989; Czaja, undated manuscript)

- A study comparing performance of 22 young adults (20-39) and 24 older ones (50-84) in word-processing training found that older adults took twice as long as younger ones but achieved nearly equal performance levels. The older adults requested help two to three times as frequently. Performance in training and attitude toward computers were directly related. (Zandri and Charness, 1989)

- When older adults aged 65-75 and younger adults aged 18-30, without prior computer experience, participated in two training sessions a week over several weeks, the older adults proved able to learn computer word processing skills and to use that expertise to solve prob-

> lems. Information recall about the word processing program was similar in both groups. There were some differences in the two groups' performance, however. Although there were no differences in the degree to which both groups selected the most efficient computer operations and carried them out correctly, the older adults needed more time to select and carry out procedures and more assistance during editing tasks. (Hartley, 1984)

One study was found which examined the performance of older and younger people in computer familiarization and spreadsheet training (Gist, Rosen, and Schwoerer, 1988). That study compared younger and older trainees' mastery through two different training techniques -- video modeling and interactive tutorial training. The video modeling, in which a model demonstrated each step of the program followed by trainees' replication of the steps at their work stations, proved more effective than the tutorial approach for both younger and older trainees; yet, while both age groups demonstrated learning gains, the younger trainees performed better than those over 45 with both training techniques.

The above studies suggest that, with appropriate training techniques, older workers can adjust to computerized word-processing; more work is needed to determine whether and under what circumstances older trainees can learn to perform as well as their younger counterparts. Useful techniques include: pairing trainees, using an instructor to provide individual attention rather than relying on software manuals, demonstrating rather than describing the correct steps, using self-paced learning with adequate practice time, and monitoring progress to rectify problems before they result in a negative attitude which could negatively affect performance.

Anticipated Impact of Other Computer-based Technologies

Computerized word-processing is a pervasive phenomenon already, but other computer-based technologies on the horizon have the potential to transform the workplace even more than those in common use today.

In anticipation of the widespread introduction of computer-aided design (CAD) and computer-aided manufacturing (CAM) in the durable goods sector, AARP researchers have begun studying the likely impact of CAD/CAM on older workers. Preliminary findings indicate that CAD/CAM is unlikely to cause significant displacement of older workers prior to the year 2000, because they are not heavily represented in occupations likely to be most severely impacted. However, that optimistic outlook looks dimmer beyond the year 2000, when the numbers of middle-aged worker will swell. The study concluded that CAD/CAM's effect on the labor force will be determined by the availability of training and the willingness of workers to be retrained. (AARP Worker Equity, July/August 1988, September/October 1988)

The changing skill requirements CAD/CAM will cause are expected to range from deskilling (reducing the skills required to perform a job) in some occupations to skill expansion in others. When those changes occur, the extent to which older workers will adjust will depend on whether they are willing and able to be retrained, and whether they have the opportunity for retraining. (Meier, 1988)

Of more immediate concern is the introduction of robotics. The average age of workers in the manufacturing sector, where robotics have been most prevalent, is relatively high. The introduction of robotics is expected to displace some workers and to lower the required skill and education levels of other workers as robots take over some of their job tasks. However, the majority of jobs associated with programming and maintaining robotics require a post-secondary education; the educational levels of most of the workers displaced by robotic systems have a high school background at best, which makes retraining for those new jobs unlikely. (Kearsley, 1989)

Older Worker Attitudes toward Computer Technology

Few systematic studies have been undertaken that assess attitudes toward computer-based technological change among adults generally, (Lewis, 1988), which compounds the lack of knowledge on older worker performance on computers. Some tentative conclusions are summarized below:

- A nationwide survey sponsored by Honeywell, Inc., in 1984 found that, among nonusers, younger secretaries were found to view automated equipment more favorably than their older peers. (Gallant, 1984) Later studies found that gender and amount of experience with computers, along with age, affected attitudes toward computers; older people, women, and people who avoid technologies such as automatic bank tellers were found to be more amenable to computer-based change. (Krauss, 1985)

- However, it may be that tenure on the job, rather than age, is the key determinant of resistance to the introduction of computers; people with a long history with one company are more likely to resist computers than a person the same age who has changed jobs. (Lewis, 1988)

- Among older trainees, positive attitudes at the end of computer training correlate with higher test scores after the training. (Zandri, 1989)

- Whether age or tenure has more influence on resistance to computers hardly matters for older workers as a group, since voluntary job and occupational mobility declines with age. (Markey, 1989)

- Research on attitudes toward computers of 225 low-literate adults, 15 percent of whom were 40 and over, found that computer anxiety was real, but could be alleviated by techniques such as taking the computer apart to demystify it, using peer tutors and group work, holding classes in nontraditional locations, and inviting female guest speakers to debunk the myth that computers are a male domain. (Lewis, 1988)

Even IBM has no data on the responsiveness of their older versus younger employees to computer training. Nor has the IBM sales staff ever attempted to study older workers among clients' staffs

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in terms of responsiveness to new technology. (Burdick,1990) This appears to be a non-issue for many companies whose business is computer sales and training; a representative from Xerox's Leesburg, Virginia, training facility agreed, saying that the Xerox training staff was not accustomed to thinking about older workers any differently from other workers. The Travelers Companies is planning to study the differences in older and younger people's responses to computer training, but the company has no such statistics now. (Gold, 1990)

On the other hand, IBM has noted an increased willingness to change jobs (which generally requires additional training) on the part of its long-time workers, some of whom are older workers. In a study of the flexibility and mobility of its staff, IBM found that there was a linear correlation between years of service and willingness to change jobs. That study did not look at employees by age, but, to the extent that years of service indicates advanced age, IBM's older workers appear more willing than younger ones to learn new skills. (Cummings, IBM) (IBM's experience may not be typical; management surveys have documented a perceived resistance to training among older workers. At IBM, continuous training is an integral part of the corporate culture; it is possible that longer-tenured workers may simply have been exposed to that element of the corporate culture to a greater degree than newer workers, accounting for their positive attitude toward training.)

Despite the lack of empirical data, there is a growing body of anecdotal information about older workers' feelings about computers. Success stories generally include some technique aimed at increasing older worker comfort levels in the face of computers and other unfamiliar technology.

In Colorado, participants in the Job Training Partnership Act older worker program may attend a three-day computer familiarization workshop, designed to reduce computer anxiety levels. Most of the participants in that session feel comfortable enough to enroll in a three-month, in-depth computer-related course. (Alegria and Lordeman, 1988)

One interesting approach is that of Senior Employment Resources (SER) in Fairfax, Virginia, which trains and places people aged 55 and older, as well as refugees as young as 45. SER chairman Jarrold Kieffer observed that older people "were nervous around computers and bolted" when they enrolled in regular computer training or were offered computer training by a prospective employer, so he instituted "pre-training" -- 10 hours of one-to-one word processing instruction on computers, along with ample time to practice. SER's expectation was that, once the trainees found jobs, their employers would provide further training, whether on different equipment or different software. The pre-training was intended to get the older people accustomed to computers. Thirteen of the first 15 pre-training participants found computer-related jobs.

Another example of the value of lowering the stress levels associated with computers is the Silver Foxes, a Louisville, Kentucky club that offers classes to adults over 50. The club uses older instructors, small classes, and a slow training pace. Some members attend because they are feeling left out at work, and are afraid of losing face by seeking training through their employer; others are concerned about acquiring marketable skills for the future. (Fyock, in press)

Management Attitudes toward Older Workers and Computers

Good data do exist on management perceptions about older workers and computers. Most recently, only 22 percent of human resource executives in an AARP survey felt that older workers were comfortable with new technologies such as computers, yet they rated comfort with new technologies as an essential or very important employee quality. One tentative conclusion of that study was that companies are increasingly relying on younger workers to perform vital, computer-related tasks rather than retraining older workers to use the new technology; three quarters of the respondents agreed that "our younger employees represent the future of the industry and we should focus our training and development efforts on them." (Yankelovich, 1989)

Despite the AARP findings, attitudinal change may be underway at some levels and in some segments of the private sector. Interviews with personnel and training administrators in the retail, insurance, manufacturing, and construction industries as part of a study for the Commission on Skills in the American Workforce have yielded a preliminary impression that, although new technology is initially a barrier for older workers, they are able to overcome these problems in many cases. (Wills, 1990)

Conclusion

In addition to the high levels of basic literacy, problem-solving and reasoning skills, flexibility, and high self-esteem considered critical to the complex retraining required when computer technology is introduced into the workplace, the most fundamental ability necessary for retraining is the willingness to participate in a virtually constant state of learning. For those older workers who lack the confidence and motivation to engage in formal training and education programs, alternatives need to be devised to avoid skills obsolescence.

V. OLDER WORKER TRAINING: RESEARCH AND APPLICATION

Research on what works in older worker training situations echoes the situation described earlier regarding research on older worker access to training: Relatively little is known. We know that older people can indeed learn new skills, and useful work has been done on developing adult learning principles which are applicable to older adults as well. What is missing is information about how these techniques work in a job training setting, and how extensively they have been integrated into the opportunities older workers have for training and retraining.

Older Workers' Capacity for Learning

Studies on the ability of the older worker to learn date back to the 1920s. Most researchers since then have agreed that, generally, older persons can learn as well as younger persons. Some of the studies show small age-based differences in performance in a training setting, although differences in training methodologies or training atmosphere do show up. (Doering, Rhodes, and Schuster, 1983)

Age-related changes in learning ability which showed up in the learning literature through 1964 were minor, with differences among various age groups related more to motivation level, physiological condition, attention, and perception than to learning ability. (Birren, 1964) Studies since then have corroborated the earlier findings, and confirmed that older workers learn more successfully from the use of programmed materials than from traditional teaching methods in which information was presented more randomly. The programmed training methodology seems to minimize trainee stress -- a factor that various studies have shown affects older worker trainability negatively. Even with programmed teaching, however, there is evidence that older people require more time to complete the learning program; 67-84-year-olds needed 103 minutes to complete a learning program that 16-32-year-olds accomplished in 45 minutes. (Doering, Rhodes, and Schuster, 1983)

Relationship of Basic Skills Deficits to Training Success

Recent national recognition of basic skills deficits, reflected both in the private sector's expenditures on basic skills training for new hires and in the increased emphasis on basic skills acquisition for adult participants in the federally funded Job Training Partnership Act, is certainly relevant to the trainability of older workers. Failure to complete high school or to acquire any formal education after high school was more common, and less of a stigma, 30 or 40 years ago than it is now; it was also easier for less educated workers to enter the labor force then than now. Consequently, some older workers may never have developed their basic skill levels to the degree needed for training in today's economy, raising the possibility that they need basic skills remediation in order to benefit from occupational skills training or retraining.

Older dislocated workers often have especially serious basic skills deficits. Job loss in mature industries and job growth in the service sector has thrown a number of workers into a job market requiring vastly different skills and education; in this environment, the biggest barrier many older dislocated workers face is their lack of a high school diploma and/or inadequate language and math skills. (Teegarden, 1988)

For example, 32 percent of dislocated workers identified by the Bureau of Labor Statistics in January 1984 had less than a high-school education. (U.S. General Accounting Office, 1987) Basic skill levels among older displaced homemakers are even lower than for dislocated workers, making them unlikely to meet the minimum standards for many types of training. Fifty-six percent of displaced homemakers between 55 and 64 had not completed high school at the time of the 1980 Census, and nearly three out of five of the non-completers had less than an eighth grade education; educational levels for displaced homemakers 65 and over are dramatically lower. (Rothstein, 1987)

Even those older workers or older job seekers who had decent computational skills at one time are likely to have lost them if they have not been utilized since classroom days. Peer counseling is one effective way to deal with older worker fear of classroom settings. (Teegarden, 1988)

Basic skills deficits in older people are not necessarily a predictor of failure in a training setting. For example, in a 1967 study of 60 male railroad workers aged 41 to 60 who were to be trained to perform complex clerical tasks which required a high degree of accuracy, the set qualifying scores had to be lowered in order for the men to be admitted. However, once they were admitted into the training, 63 percent completed the program and were placed in training-related jobs. (Stewart, 1969)

Lessons from the Private Sector

While a handful of companies run programs designed specifically to keep their older workers employed, there is no statistical evidence to indicate that those programs represent anything more than a few enlightened companies's efforts to address a problem that is facing virtually all segments of the economy. (Bove', 1987) Neither is there much information on how well those programs work. Few companies even try to evaluate the costs and benefits associated with providing training for their older employees. (American Society of Personnel Administration/Commerce Clearinghouse, 1988)

Human resource professionals contacted for this report were either unwilling or truly unable to discuss training opportunities in relation to age. To some extent, this seems to be because businesses do not keep records of participation in training by age of employee. As noted earlier, there is a very real fear that any focus on age of trainees could give rise to accusations of age discrimination. Nonetheless, even some companies which have received favorable publicity for making training available to older employees, such as General Electric Company, refused to discuss their training policies and programs for this report.

When anonymity is assured, however, two-thirds of the human resource managers who participated in a late-1987 survey acknowledged that special training techniques may enhance efforts to avoid skills obsolescence among older employees. Self-paced learning, experiential training, on-the-job coaching, pragmatic or application-oriented training, and training which senior employees help design were among the techniques cited. However, efforts to train seniors are hampered by several factors, according to the survey. Fifty-nine percent of the managers surveyed reported encountering moderate to great resistance to training among older employees; and 52 percent found that older employees have trouble mastering new concepts, ideas, and approaches. However, despite the prevalent awareness that seniors have distinct training needs, only 38 percent of the companies represented conduct an annual needs assessment to identify training needs, and only 29 percent offer training and development for senior employees. (American Society of Personnel Administration/Commerce Clearinghouse, 1988)

While the attitudes described above suggest some degree of comprehension that older workers may have specialized training needs, they also show a lack of commitment to meeting those needs. It is hardly surprising that information on older worker performance in training situations is sparse, given that older worker training is not a priority for business.

Even The Travelers Companies, known for its age-neutral employment policies and its affirmative efforts to train older people for part-time and temporary work after retirement, has no data on how well older people perform in the various training situations. Harry Gold, training officer at The Travelers, cited anecdotal impressions that older trainees have more trouble than younger ones in learning to use word processing programs, Lotus 1-2-3, and other computer programs through the self-paced, video-instruction approach that The Travelers uses. The retirees appear to have more questions than younger trainees, and are less able to learn on their own; they either seek the assistance of human beings to explain what the machines have failed to convey, or they do not complete the training, even though they have opportunity for ample practice time on the computer.

The Travelers experience fits with what some Job Training Partnership Act programs have found: Older workers faced with computer training are more comfortable in one-on-one training situations, with ready access to an instructor in the event of questions, than in a setting in which they are primarily reliant on computer-assisted learning.

Travelers is currently in the early stages of putting together a training program for the in-house temporary agency, through which many retirees work. Based on the unsatisfactory results from the computer-based training, the new program will be computer-assisted, with an instructor rather than a video. Gold expects that there will be statistics on age-related learning differences once that course gets under way; now, however, the company has no age-related data on training performance.

One frequently cited study of older worker retraining in the private sector analyzed the transformation of an Aer Lingus cargo warehouse to a semiautomatic facility with computerized document storage. (Mullan, 1972) Communication, participation, and active-discovery learning influenced the way the transformation and the training took place, resulting in the middle-aged workers successfully learning their new roles and becoming accustomed to the new computer technology. However, the fact that this relatively old study is so often referenced suggests a research gap in the nearly two decades since it was published.

More recently, through a public/private partnership, the worker assistance centers in Massachusetts used adult learning principles to disprove the accepted wisdom that dislocated manufacturing workers end up in lower-paid service positions. The worker assistance centers found that appropriately designed training can help highly skilled manufacturing workers transfer their skills to similar manufacturing processes, which is particularly appealing to older workers who feel that they don't have the time for complete retraining. The worker assistance program Massachusetts developed with General Dynamics provided many workers with upgrading training to expand existing manufacturing and construction skills. Even the training for service industry jobs was designed to build on previous skills. (Teegarden, 1988)

Lessons from the Public Sector

Relatively little evaluation has been done of service to older workers through public sector training programs. These include the Job Training Partnership Act, the Senior Community Service Employment Act (Title V of the Older Americans Act), vocational education programs, and displaced homemaker programs.

Given the lack of national data that the federal government collects on the Older Worker Set-Aside of the Job Training Partnership Act, the best information is probably that compiled by the National Governors' Association and the National Association of State Units on Aging through an ongoing series of conference calls with state program operators. They found a wide range of occupational training being provided, with clerical training and home care training the most common. Few states seem to be running classroom training through this program, with on-the-job training the most usual form of occupational skills enhancement. Job search assistance, motivational training, and counseling are much more frequently offered than is job skills training.

Older workers are represented among both JTPA's mainstream adult programs and its dislocated worker programs, but they are disproportionately underserved through both. (U.S. General Accounting Office, 1987 and 1990) There is virtually no information on the types of training older workers obtained through those programs.

The vocational education system has traditionally been geared to a relatively young student population. Vocational institutions are increasingly receiving JTPA older worker funds, but the American Vocational Association could identify no source of information on older students' experience with the vocational education system.

No systematic research has been undertaken to evaluate older women's participation in displaced homemaker programs. (Shaw, 1988). While the Displaced Homemakers Network has compiled best practices from the five demonstration sites in its Older Women's Employment Project, the resulting manual's covers counseling, supportive services, and life and job search skill development, rather than job training. (Quinlan, unpublished)

Lessons from Japan (Osako, 1989)

Of all the industrialized nations, Japan -- with the highest average life expectancy in the world (Dychtwald, 1989) -- may have the most enlightened public policies on older worker employment. Although companies are permitted to establish mandatory retirement at age 60, the government promotes continued employment through age 65, and endorses job training as a way to keep older persons productive in a technologically changing economy.

For example, the government provides subsidies and consultation to corporations intending to train workers 45 and over; the training subsidy rate rises for workers as they approach planned retirement, up to one-half the cost of the training. Public policy also encourages post-retirement career change. For example, workers 50 and over who pay for training in marketable job skills are reimbursed for half those costs. Also, a retiree's most recent employer is responsible for assisting in that person's job search.

Japanese labor unions actively support training courses for older workers, including the development of technical knowledge and skills, both by encouraging management to provide training and by providing it themselves.

The impact of these policies is striking, in contrast with the situation in the U.S. Recent surveys show that up to 97 percent of firms consider it worthwhile to train older workers, and nearly half of larger firms and 17 percent of smaller ones have job training programs for older workers.

The Consensus on Older Worker Training Principles

While there is general agreement on some of the training techniques which can enhance adult learning, there is less consensus that older and younger adult workers have different training needs. (Mintz, 1986) Some experts have suggested that the general adult learning principles can be successful with older adults, as long as the training program is carefully developed, with task analysis as a central component. Others speculate that older people require special training methods (Welford, 1988); while this hypothesis has not been sufficiently tested, initial research does not support it (Gist, Rosen, and Schwoerer, 1988).

Much current thinking has as its foundation the work of the Belbins in England in the late 1960s and early 1970s, using three approaches: the discovery method, activity learning, and programmed instruction. The discovery method boosts the older worker's motivation by giving the trainee responsibility for training rate and progression, and dividing learning into small units which build upon each other. The discovery method involves minimal instruction; rather, it puts the burden of learning on the trainee, with the trainer's role limited to observing trainee errors and presenting new material when warranted by trainee performance. (Welford, 1988) Activity learning, or hands-on training, involves learner manipulation or processing of the material to be learned, rather than passive observation or listening. Activity learning is most effective when it stimulates creative thinking, rather than merely a series of mechanical responses. Programmed instruction presents material systematically through a book, computer, or other device. In contrast to the traditional classroom setting, programmed instruction provides immediate feedback and positive reinforcement of correct responses. (Sterns, 1987)

Other researchers have found that older workers find adjusting to technological change much more difficult than younger workers, particularly in the traditional manufacturing industries with a relatively older work force. Older workers were often unable or unwilling to be retrained for new jobs, and had difficulty meeting the requirements for speed and attention to detail of new tasks. Technological change coupled with relocation of the worksite or additional shift work compounded the difficulties older workers experienced. (Flynn, 1988)

There is evidence that stress impacts more negatively on older trainees than on their younger counterparts. (Tager, 1988) Observation of older displaced workers in retraining situations proves that anxiety must be controlled in order for effective learning to occur. Because testing can cause stress, which then inhibits learning, some experts suggest that testing be minimized; when testing is necessary, frequent testing with feedback on test results can help seniors who are being retrained get accustomed to being tested. (Miller, 1989)

Recommendations on retraining older industrial workers for the emerging service economy are also useful in countering age-related declines. (Miller, 1989) For example, memory for the **names** of objects and people may begin to decline in the sixties. If this ability is crucial for a specific job, mediation imagery and mnemonics can be taught to help older workers remember names. Otherwise, instructors should not require name memorization unless it will be essential for job performance. A related issue is that the need to acquiring new terminology can be threatening to older workers, but instructors can work around that problem by letting older workers study technical terms outside the classroom and by avoiding the use of jargon until the trainees have mastered it.

Distractions should be minimized, as they become more detrimental as a person ages because of decreases in the ability to divide attention. The impact of distractions can be limited by conducting training away from the work site; arranging the curriculum to allow learners to master one topic before moving on to another; and including a module on focusing attention and blocking distractions, and another one on time management.

Perhaps the strongest influence on adult learning principles is Malcolm Knowles, who pioneered in this country the system of concepts known as andragogy -- the art and science of helping adults learn, based on the learner as an active participant in designing and delivering the learning program. (Knowles and Associates, 1984)

Knowles' principles as applied to older workers have been summarized as follows: First, the physical environment and psychological climate of the training setting need to accommodate the declines in physiological functioning that affect older people to varying degrees. Second, traditional school methods such as lectures are less effective than group discussion and problem-solving, in part because those techniques more closely emulate real-life work processes and in part because they mitigate the anxiety many older adults feel about returning to the classroom after decades away from it. Third, older workers' extensive job and life experiences can enrich the training experience and must be integrated into the learning program. And fourth, older workers' learning motivations relate directly to whatever career and life changes they are undergoing. (Sterns, 1988)

Cumulative experience in corporations, government, higher education, remedial education, and other learning settings supports various techniques that grow out of these adult learning principles as particularly effective for older adults; e.g., training should be self-directed, self-paced, hands-on, related to life experiences, individualized, etc. The Massachusetts experience with training older dislocated workers found the following design considerations effective (Teegarden, 1988):

- Combine remedial education with vocational training to underscore the relevancy of the remedial education and shorten the total training period.
- Use intensive training to keep training periods short.
- Build on existing skills.
- Use peer support.
- Make support services available as necessary to enable participants to remain in training (e.g., health insurance supplements, transportation, payments for books).
- Offer training for demand occupations that offer wages comparable to previous employment.

These conclusions are shared by many trainers with expertise in older worker learning who were interviewed for this report or for other studies, and Knowles cites a number of studies that document the success of self-directed learning and other elements of andragogy. (Knowles and Associates, 1984) He and others agree, though, that studies on the application of these principles in job training situations are needed.

Application of Research Principles

There is very little data on the way adult learning principles and older worker training recommendations really work in a job training situation. Generally available information reports success rates in terms of job placement. Kearsley's recent review of available studies on retraining led him to call for the development of qualitative data -- either case studies or a comprehensive survey -- on what training/retraining strategies work and how training is actually accomplished. (Kearsley, 1989)

Indeed, the workforce may be aging too quickly for the American economy to cope adequately. The Congress, various administrations, foundations, research institutions, and corporations continue to spend billions of dollars on researching and applying training strategies for youth; yet, faced with demographic predictions that one-third of the population will be 55 or older by the year 2030, these institutions have done little to understand how to train and retrain older workers.

Several expert witnesses in recent Congressional hearings have identified specific research gaps on age-related productivity and technological adaptability. Even the Assistant Secretary of Labor for Employment and Training has acknowledged that, before we invest heavily in existing institutional settings such as vocational/technical schools and community colleges, we need to examine the effectiveness of those systems vis-a-vis older workers. (Jones, 1988)

Federally funded job training programs aimed at low-income older people and seniors with other employment barriers (e.g., displaced homemakers, reentry women, dislocated workers) have found it effective to provide motivational and confidence-building sessions prior to skills training to combat the self-fulfilling prophecy of older workers who expect to do poorly in training and then proceed to do so. (Alegria and Lordeman, 1988) Such techniques could be helpful prior to skills training in the private sector as well, particularly when computer skills are involved (American Society of Personnel Administration/Commerce Clearinghouse, 1988); however, this investigation found no evidence that private companies are assisting older trainees in this way.

One reason for the problem is that the extensive research on adult learning principles has not been adequately coupled with what we know about age-related changes and made easily available to private and public sector training programs. The popular press' rather alarmist treatment of the aging workforce needs to be expanded with attention to older worker training issues. Older worker training and retraining need to move onto the agenda of more human resource professionals and come to the attention of high-level policymakers.

There are positive moves in this direction. The popularity of Ken Dychtwald's **Age Wave** (1989) is promising, although his chapter on workplace changes offers only a few pages on training and retraining. An introduction for business on managing older workers, to be published this year, identifies some of the specific adjustments trainers should make to ensure older participants maximum benefit: using self-paced training, preparing training materials with high-contrast colors and bold typeface, avoiding posting training materials above eye level, paying attention to acoustics, and using adult learning principles. (Fyock, in press) Yet the low level of private sector acknowledgement of age as a training issue, as documented in this paper, shows that readiness to incorporate older worker learning strategies in workplace training may still be a ways in the future.

One additional condition is necessary to foster a fuller understanding of older worker training needs and strategies. The many experts who study issues related to older workers need to pay more attention to training. With few exceptions, most of the past decade's otherwise excellent books and papers on the aging of the workforce and the management and utilization of older workers devote very little space to the issue of training. (e.g., Doering, 1983; National Commission for Employment Policy, 1985; Bureau of National Affairs, 1987). Even treatments of older worker retention strategies tend to focus on changing pension systems and expanding the options for less-than-full-time work, failing to examine access to training as an incentive for continued work (e.g., Morrison, 1986; Burkhauser and Quinn, 1989).

VI. ISSUES AND OPTIONS

Issue One. Should Congress increase federal funds for research and development in ergonomics, working arrangements, and training for older workers?

The Bureau of Labor Statistics predicts that the growth of the US labor force will slow perceptibly between 1988 and 2000. Although the population over age 55 is projected to grow rapidly during that time period and beyond, the share of the labor force comprised of older workers is not expected to increase unless current labor force participation and retirement trends are altered. A growing older worker population not proportionately represented in the work force could result in significant productivity losses and labor shortages, unless government and businesses adopt new strategies to encourage continued employment opportunities beyond "traditional" retirement age.

Moreover, the front end of the baby boom generation will begin reaching its mid-forties during the coming decade, as technological change continues to occur ever more rapidly. In order to keep that population bulge working productively, frequent retraining will be a necessity; more knowledge is needed about the most effective ways to train middle-aged and older workers or baby boomers will be hindered from contributing fully to economic growth.

To date, there has been little federal involvement in older worker issues. Not only are program funding levels low, but the federal role vis-a-vis older workers has been limited to small training and placement programs for economically disadvantaged workers over 55, and inadequately funded enforcement of the Age Discrimination in Employment Act (ADEA). The federal job training programs are remedial rather than preventive, and address only a small percentage of those workers "at the bottom of the barrel." ADEA enforcement has been hampered both by lack of direction and by lack of funds for that purpose at the Equal Employment Opportunities Commission.

> Option 1: Congress could maintain the current level of funding for older worker research and development.

This option would fail to address the issues facing the nation today or in the next decades. There is currently virtually no federal funding for research and development in training, working arrangements, or ergonomics for older workers.

At the end of the last Administration, the U.S. Department of Labor (DOL) issued a report on key policy issues for the future. That report, prepared by the Department's Older Worker Task Force, called for the government "to support research into the most effective training techniques designed to enhance and utilize the talents and skills of older workers, and assist in the deployment of this information" and "to design and administer employment and training programs that take into account the capabilities and special needs of older workers." Yet, to date, no funding has been directed toward those purposes.

The Labor Department's current research and development priorities are not oriented toward older persons. What little has been done in the past related to older workers has been tied to federal programs aimed at low-income older workers -- not a direction that meets business needs or advances national competitiveness.

The Administration on Aging of the Health and Human Services Department funds a variety of special projects each year. AOA's discretionary funding program for 1990 (through which AOA funds its research and development initiatives) includes no requests for proposals related to employment. Although there are a few priority areas in which employment-related submissions could be developed (e.g., public/private partnerships, field-initiated research and demonstration projects), employment is not specified as a topic area in which any projects will definitely be funded.

Option 2: Congress could increase the level of federal funding for older worker research and development.

The Administration on Aging and the Employment and Training Administration (ETA) of the Department of Labor have recently signed a memorandum of understanding, which opens the door for increased cooperation between the two departments. New funds administered through that memorandum of understanding could draw the two most relevant federal departments together in a joint effort to test and develop effective strategies to increase older worker productivity.

Alternatively, the Congress could earmark a part of the Department of Labor's research and demonstration budget for projects related to training needs and working conditions of older workers. Currently, the Department's priorities do not include any emphasis on older worker issues.

Another way to direct increased funding at older worker issues would be through the Administration on Aging. However, there has been little focus on employment at AOA in the past five years, and the staff capacity might be more easily built up at DOL than at AOA; the previous Administration's Older Worker Task Force was a staff group, and the Department's responsibilities for job training programs have required staff to maintain some involvement with older worker issues.

Finally, Congress could use a provision of the Age Discrimination in Employment Act as a vehicle for funding older worker research and development. One of that Act's stated purposes is "to help employers and workers find ways of meeting problems arising from the impact of age on employment"; yet funds have never been available for to carry out that purpose of the Act. ADEA directs the Secretary of Labor to undertake research and disseminating the findings widely, to use the Employment Service to expand older worker opportunities, and to conduct informational and educational programs.

Issue Two: Should Congress consolidate federal support for older worker employment issues in one agency?

Four agencies could logically have some jurisdiction over older worker ergonomics, working arrangements, and training: the Departments of Labor, Education, and Commerce, and the Administration on Aging within HHS. Currently, only the Department of

Labor has any real involvement with older worker issues, and that is minimal. Labor oversees the Job Training Partnership Act (the nation's premier job training program which trains only a relatively small number of economically disadvantaged and dislocated older workers) and the Senior Community Service Employment Program (Title V of the Older Americans Act, which provides minimum wage work experience for economically disadvantaged older people).

Of the other three agencies, AOA has had little involvement with employment issues since the mid-1980s; although AOA has jurisdiction over the Older Americans Act which establishes Title V, the Title V program itself is Labor's responsibility. The extent of AOA's involvement is its funding of a very few grants with some employment focus, but, as noted above, employment is not a priority in AOA's grantmaking activities. The older worker provisions in the Perkins Vocational Education Act which the Department of Education administers have never been funded, and the Adult Basic Education program is not particularly geared to older adults, nor is it at all employment-oriented. The Department of Commerce's Economic Development Administration, through which some employment initiatives had been handled on an interdepartmental basis in years past, has never focused on older worker employment.

Amendments to the Job Training Partnership Act, through which economically disadvantaged and dislocated older workers receive some training and placement services, are being considered in the current Congressional session. Current proposals would likely reduce JTPA's older worker service levels, and older worker advocates argue that they would also reduce the quality of that service. DOL has not been an advocate of a continued older worker set-aside through JTPA.

The Perkins Act is up for reauthorization this year. Congress could use reauthorization to fund the law's provision that a model center be established to explore ways of meeting the special vocational and employment needs of older individuals. Congress could also fund some of the Act's other special programs which could promote the knowledge base on older worker job training.

The Older Americans Act, up for reauthorization in 1991, could be amended to strengthen the training focus of the Title V program, both by increasing the program's emphasis on training and private sector placement and by providing special funding for the private-sector-oriented 502(e) experimental programs.

Option 1: Congress could maintain the status quo.

The current situation leaves older worker ergonomics, work arrangements, and training issues without a strong base in any of the federal agencies. Older worker issues are only a very minor part of the Department of Labor's concerns, and AOA's involvement has declined steadily since 1985. Maintaining the status quo would leave no agency specifically and identifiably responsible for advancing the state of knowledge and practice regarding older worker employment strategies.

In order for the status quo arrangement to produce any advances in the state of older worker employment knowledge, Congress would likely have to specifically direct the various agencies to conduct older worker research and development on specific issues, with timetables and dollar amounts identified as well. The main advantage to this approach would be the potential for creating a vested interest in several departments in advancing older worker training and employment strategies.

Option 2: Congress could consolidate all federal older worker activity in the Department of Labor.

This option makes the most sense from a programmatic point of view, but there are three drawbacks. First, DOL has provided relatively little technical assistance or program support for older worker training through JTPA, and that has been limited to small grants to national organizations and a few regional conferences run by contractors; in-house older worker staffing is minimal. Second, while DOL staff capacity in employment and training is significant, that agency has no responsibility to track the age-related changes that make special training and work arrangements appropriate for many older workers; however, the recent memorandum of understanding between ETA and AOA. And third, the DOL Employment and Training Administration currently focuses primarily on programs for economically disadvantaged and dislocated workers, while the national need for increasing older worker productivity extends to current, potential, and future, older workers at all income levels.

Option 3: Congress could consolidate all federal older worker activity in the Administration on Aging.

This option has the advantage of locating older worker employment research and development in the agency in which other concerns related to aging are housed; that has both a substantive and an image advantage. However, it runs the risk that older worker issues would become isolated from mainstream employment and training issues -- a result that could be increasingly disastrous as the population (and the labor force) ages. Middle-aged and older workers' needs can be most effectively met if they are incorporated as an integral but mandated part of workforce planning and preparation.

Option 4: Congress could recommend establishment of a Cabinet-level Department on Aging, with responsibility for older worker employment issues as well as other concerns.

This is an unlikely scenario in the current budget climate, especially when two new Cabinet departments (veterans and environment) have just been established. However, the number of people who would be impacted by a Cabinet-level Department on Aging is far greater than those served through the Veterans Department. The obvious advantage would be the public visibility and presidential access which a Department would confer.

Issue Three: Should Congress develop mechanisms to encourage private sector investment in older worker research and development?

Maintaining and increasing international competitiveness over the coming decades will require that older people be encouraged to remain in the workforce longer and be given the tools to remain productive in their work roles. Yet, given the current budget situation, Congress cannot rely solely on federal funds to address the nation's older worker training and working arrangement issues. While Congress must look at federal funding levels and administrative agents through which to address older worker issues, federal action alone cannot be expected to meet the need.

Option 1: Congress could implement training subsidies on a demonstration basis, adopting those that proved effective.

In Japan, where life expectancy is longer than anywhere else in the world, direct subsidies are available for companies and for individual workers to defray the costs of training workers nearing traditional retirement age. Congress could test and study the impact of such subsidies on various industries and under various conditions; those that proved cost-effective in leveraging corporate or individual investment could be implemented as needed.

The Individual Training Accounts (ITAs) that have been discussed over the past few years would have defrayed a portion of individual workers' investments in their own training; the fact that the ITA concept is no longer under active consideration may mean that training subsidies to individuals would not be politically feasible, particularly in the current budget climate.

Option 2: Congress could amend the tax code to promote corporate investment in training and retraining.

A tax credit for companies that invest beyond a specific level in worker training and retraining is a possible strategy. There are currently discussions of such a credit that would apply to training for nonsupervisory personnel. Any such change in the tax code, however, would require an accompanying change that would account for the revenue loss generated by the tax credit.

Option 3: Congress could disseminate information and technical assistance aimed at encouraging private sector investment in older worker research and demonstration.

According to human capital investment theory, businesses invest in training workers based on their expected return on that training dollar. There is a common perception that young workers will remain with an employer longer than older workers, thus increasing the payback for the training investment; in fact, younger workers tend to move from job to job, while older workers are more likely to stay with one employer. A federal investment in training an older worker is likely to yield less return on investment to the national economy than a similar investment in training a younger worker, by virtue of the younger worker's longer expected work life. However, a corporate investment in training an older worker will have just the opposite effect for that business -- the younger worker is more likely to take the new skills gained through training to a competitor than is the older worker.

Congress could conduct a public information campaign on the return on investment employers can expect from training older workers, and then follow that up with technical assistance on how best to provide the training.

There are several databases of employment practices that have some relationship to older worker training technologies and working arrangements. AARP's National Older Worker Information Service (NOWIS) has brief descriptions of work and retirement programs and strategies at around 200 companies across the nation. A second clearinghouse is the federally funded Job Accommodations Network (JAN), which facilitates information-sharing on what companies have done to retain workers with various disabilities. Although JAN entries do not specify age, the fact that the prevalence of disabilities increases with age makes JAN a useful source of older worker retention and accommodation strategies.

Congress could establish a technology transfer function that would assist companies in testing and implementing the strategies identified in the databases. This could be done on a cost-sharing basis at first, with the client companies paying an increasing share of the technology transfer costs over time.

> Option 4: Congress could repeal the Social Security earnings test. To the extent that the earnings test encourages older workers to retire, it limits employers' return on the investment they make in training older workers.

The earnings test restricts the amount Social Security beneficiaries between 62 and 69 may earn without jeopardizing their benefit levels. It is possible that repealing the earnings test could result in more people in that age range remaining in the labor force and working more hours, although research is inconclusive regarding the significance of the earnings test on the extent to which older people continue to work.

There are equity and economic problems with repeal. First, elimination of the earnings test would be more beneficial to high earners than to lower income workers. A more potent argument against repeal is that the Congressional Budget Office has estimated that elimination of the earnings test would cost the federal government $24 billion in lost revenues -- a hard sell with the current budget deficit.

There is widespread misunderstanding of the earnings test, however, both among human resource professionals and among older people. Congress could minimize its negative impact on retirement decisions by funding public education programs to dispel misconceptions about the way the test affects older people in various economic circumstances.

> Option 5: Congress could recommend a 1991 White House Conference on Aging.

Aging advocates have expected that the White House would sponsor what has become a decennial conference on aging. There has been no confirmation as yet that such a conference will be held. The 1981 conference was structured along partisan political lines, and lost much support among the aging community as a result. Congress would need to ensure that the conference was open to all reasonable viewpoints and representatives. If run effectively, a White House Conference on Aging could provide a forum for older worker research findings, raise public awareness of older worker issues, and generate private sector commitment as well.

VII. A RESEARCH AGENDA

This paper recommends a national commitment to increase older worker productivity through improved training, ergonomics, and work arrangements. That goal can only be achieved if we understand the necessary steps and strategies. The need for research on older worker issues is great, but the potential payoff would justify increased expenditures in both the public and private sectors.

Most research needs fall into two areas of need: We lack data on older worker training issues, and we have had little success making what is known in one discipline accessible to others. Trainers are often unaware of the human factors findings on aging; human resource professionals are unaware of innovations which have worked well in other companies; private companies and public sector programs benefit little from each other's experiences; American policymakers know little about what has been tried in countries such as Japan; and policymakers in general have to make decisions based on insufficient and often inaccurate information.

There needs to be an increased federal role in research, program development, technology transfer, and policy initiatives to increase incentives and minimize disincentives for companies and workers.

Specific research questions follow.

1. What are the implications of age (not just years of service with a particular company or years of experience in a given job) for training opportunities and successful training and work performance?

2. What age-related decrements are inevitable, and which can be limited or avoided through improved health maintenance?

3. How can workers compensate for age-related deficits, and can workers be trained to utilize compensation techniques?

4. To what extent do older workers have inadequate access to public and employer-sponsored training?

5. What types of training do older workers obtain through public programs, and how effective is that training? Specifically, a detailed evaluation is needed of the Job Training Partnership Act's service to older workers through the Older Worker Set-Aside, the dislocated worker programs, and the mainstream adult programs.

6. How feasible would it be to adapt Japan's incentives promoting older worker training opportunities? What other incentives (e.g., training subsidies, tax credits, or new adult retraining services) might work well?

7. How do older workers perform in various training situations? How does their performance compare with younger workers? Do younger and older trainees perform differently in classroom versus on-the-job training sites?.pa

8. Which alternative training strategies promote successful outcomes among older workers? What are the cost implications of incorporating those strategies into existing training offerings?

9. What internal and external disincentives and barriers currently inhibit companies from providing training and older workers from seeking it?

10. What training strategies and career objectives are particularly effective in improving older women's work performance and job opportunities?

11. How does part-time work (the preferred mode for many older workers) affect access to training opportunities and employment benefits? Is part-time employment a viable means of keeping up current work skills or acquiring new ones?

12. What impact does the introduction of computers have on older workers' job security and job advancement? What factors affect older worker attitudes toward computers and performance in computer training?

13. What is the cost-benefit ratio of investing in new strategies to help older employees overcome obsolescence? Which of several training approaches yield the highest return on investment? Are alternative human resource management strategies such as job transfers more cost-effective than retraining?

14. How can laboratory findings on age-related changes in physiology to performance be integrated into real-life workplace settings?

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